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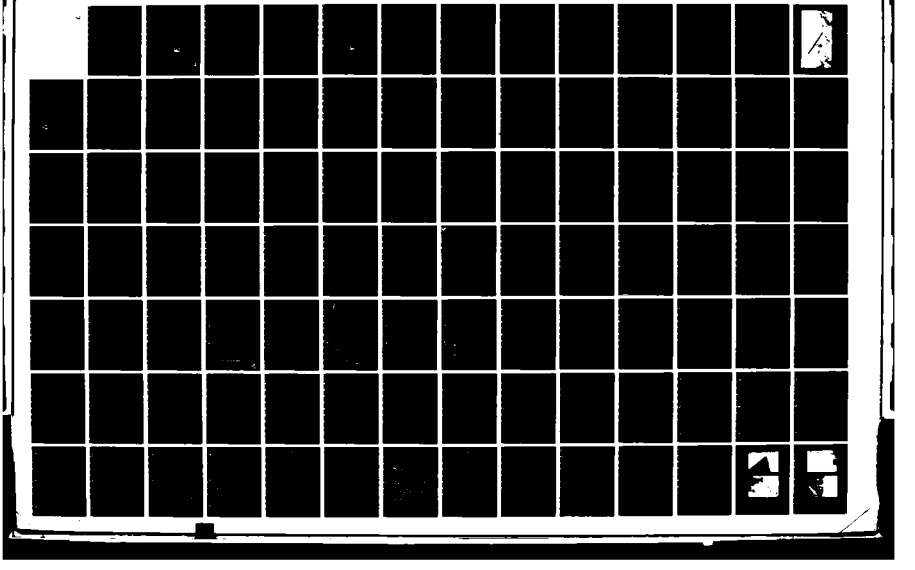
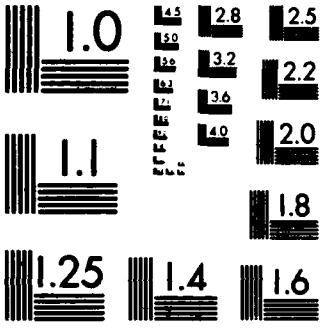


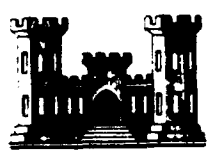


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

CONNECTICUT COASTAL BASIN
GREENWICH, CONNECTICUT

CONVERSE LAKE DAM
CT 00044

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

February 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: CT 00044 — 2. GOVT ACCESSION NO: AD-A142699	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Conn. Coastal Basin Greenwich, Conn., Converse Lake Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS	5. TYPE OF REPORT & PERIOD COVERED: INSPECTION REPORT
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254	12. REPORT DATE: February 1980
	13. NUMBER OF PAGES: 115
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Conn. Coastal Basin
Greenwich, Conn.
Converse Lake Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam, built in the early 1900's, is a stone masonry gravity section with an earth fill and a dry-laid stone retaining wall on the downstream slope. There is a series of dikes located approx. 200 ft. northwest of the dam. The dam is 175 ft. long and 8 ft. wide at the top, which is at elevation 426.7 and 30 ft. above the streambed of Converse Pond Brook. The spillway is 30 ft. long and cut into bedrock at the right end of the dam. The outlets are 16 inch and 21 inch cast iron pipes located at the central part of the dam.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 19 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Converse Lake Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Rosenstiel Estate, 600 Fifth Avenue, New York, New York 10020.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

CONNECTICUT COASTAL BASIN
GREENWICH, CONNECTICUT

CONVERSE LAKE DAM
CT 00044

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

February 1980

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	CONVERSE LAKE DAM
Inventory Number:	CT 00044
State Located:	CONNECTICUT
County Located:	FAIRFIELD
Town Located:	GREENWICH
Stream:	CONVERSE POND BROOK
Owner:	ROSENSTIEL ESTATE C/O MANUFACTURERS HANOVER TRUST COMPANY
Date of Inspection:	NOVEMBER 5, 1979
Inspection Team:	PETER M. HEYNEN, P.E.
	HECTOR MORENO, P.E.
	MIRON PETROVSKY
	JAY A. COSTELLO
	ROBERT JAHN

The dam, built in the early 1900's, is a stone masonry gravity section with an earth fill and a dry-laid stone retaining wall on the downstream slope. There is a series of dikes located approximately 200 feet northwest of the dam. The dam is 175 feet long (not including the spillway) and 8 feet wide at the top, which is at elevation 426.7 and 30 feet above the streambed of Converse Pond Brook. The spillway is 30 feet long and cut into bedrock at the right end of the dam. The outlets are 16 inch (O.D.) and 21 inch (I.D.) cast iron pipes located at the central part of the dam.

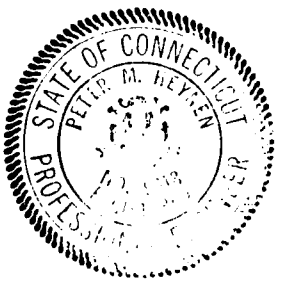
Based upon the visual inspection at the site and past performance, the dam is judged to be in poor condition. The general condition of the masonry appears to be fair, although there are trees and brush on the downstream slope and the dry laid stone retaining wall at the toe of the dam needs repair. There are areas which require monitoring and maintenance such as seepage through the dam and dikes, the growth on the downstream slope, the stone wall at the toe of the dam and brush in the spillway.

In accordance with Corps of Engineers Guidelines for size (Intermediate) and hazard (Significant) classification, the test flood range to be considered is one-half the Probable Maximum Flood (½ PMF) to the Probable Maximum Flood (PMF). For this dam the test flood is considered to be equivalent to the ½ PMF. Peak inflow to the lake at the ½ PMF is 1250 cubic feet per second (cfs); peak outflow is 690 cfs with the water level in the lake 0.7 feet below the top of the dam. The spillway capacity at the test flood is 360 cfs with the remaining 330 cfs outflow being released over the dikes. The spillway capacity with the lake level to the top of dam is 520 cfs.

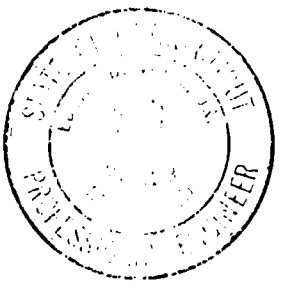
It is recommended that the owner retain the services of a registered professional engineer to perform a more detailed hydraulic/hydrologic analysis to determine the feasability of using the dikes as an auxiliary spillway or raising the dikes to the same elevation as the dam. Other items of importance are the seepage through the dam, the condition of the outlet works, the deterioration of the masonry structures and removal of the old mill dam located just downstream.

The above recommendations and further remedial measures which are discussed in Section 7, should be instituted within one (1) year of the owner's receipt of this report except where otherwise noted.

Peter M. Heynen, P.E.
Project Manager
Cahn Engineers, Inc.



Edgar B. Vinal, Jr., P.E.
Senior Vice President
Cahn Engineers, Inc.



This Phase I Inspection Report on Converse Lake Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

Joseph W. Finegan

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, CHAIRMAN
Chief, Structural Section
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions there of. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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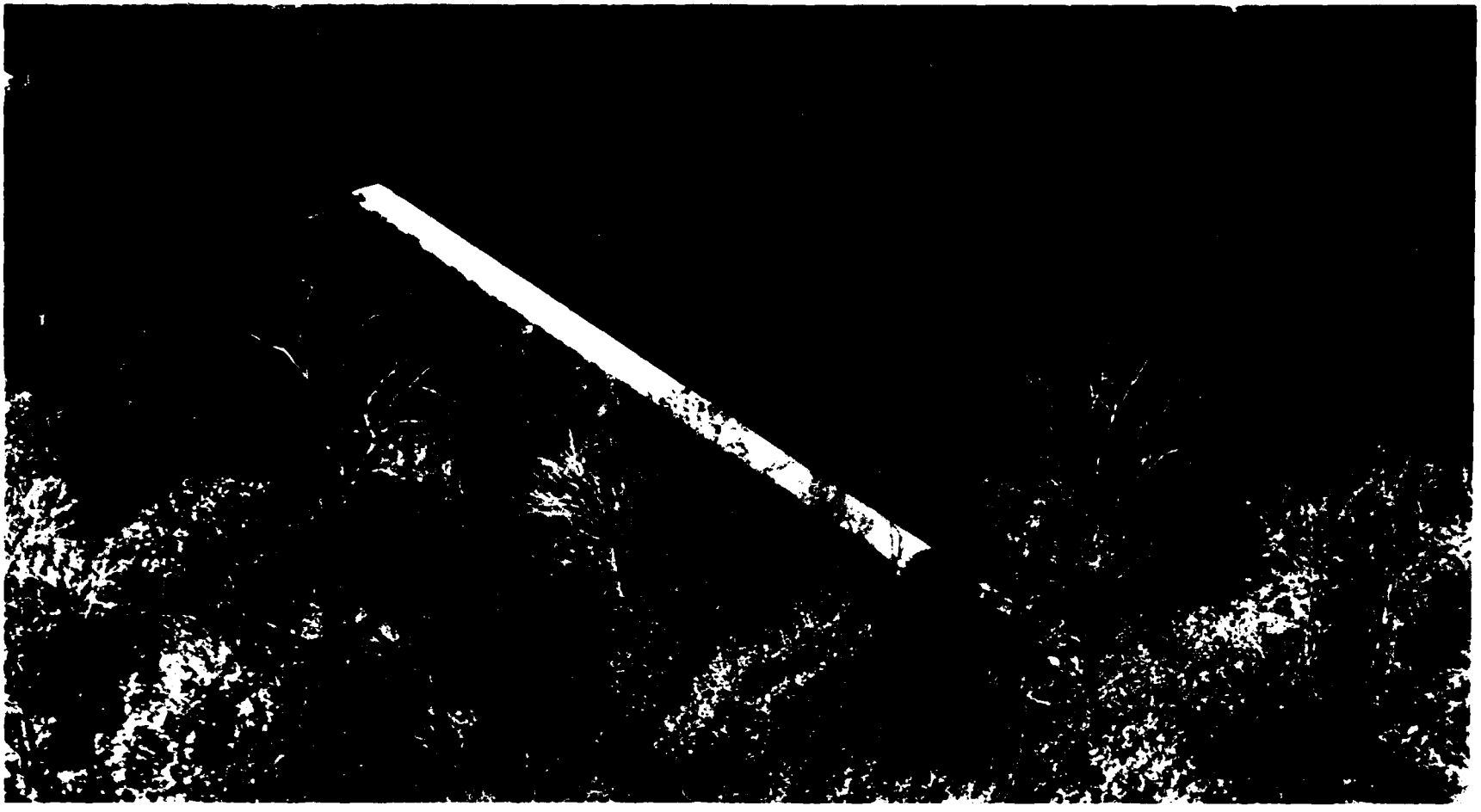
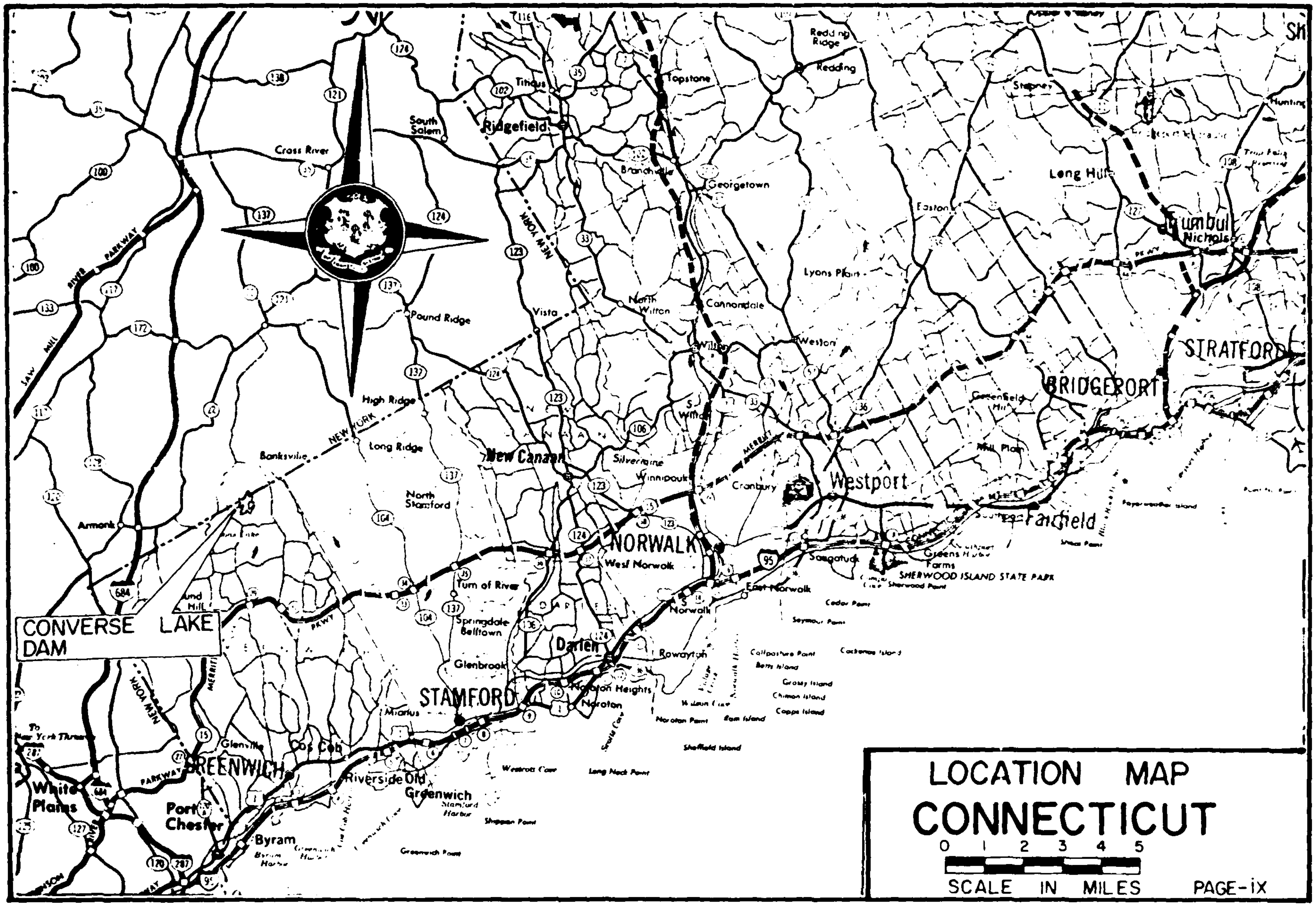
APPENDICES



OVERVIEW PHOTO
October 1979

US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF	Converse Lake Dam	Greenwich	DATE Feb '80
CAHN ENGINEERS INC WALLINGFORD, CONN ENGINEER	INSPECTION OF NON-FED DAMS	Converse Pond Brook	CONNECTICUT	CE # 27660KE PAGE viii



LOCATION MAP
CONNECTICUT
0 1 2 3 4 5
SCALE IN MILES
PAGE-IX
CONVERSE LAKE DAM
STAMFORD
NORWALK
BRIDGEPORT
STRATFORD
Westport
Fairfield
GREENWICH
New Canaan
Darien
Ridgefield
White Plains
Port Chester
Byram
Riverside
Old Greenwich
Cos Cob
Glenville
Armonk
Banksville
Long Ridge
High Ridge
Pound Ridge
North Stamford
Cross River
South Salem
Titicus
Branchville
Georgetown
Topstone
Redding
Redding Ridge
Lyons Plain
Weston
Cannondale
North Wilton
Wilton
Vista
Silvermine
Winnipauk
Cranbury
Easton
Long Hill
Nichols
Stepney
Greens Farms
SHERWOOD ISLAND STATE PARK
Saugatuck
East Norwalk
South Norwalk
West Norwalk
Rowayton
Noroton Heights
Noroton
Glenbrook
Springdale
Belltown
Turn of River
Mianus
Greenfield Hill
Mill Plain
NEW YORK

PHASE I INSPECTION REPORT

CONVERSE LAKE DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of October 15, 1979 from William E. Hodgson, Jr. Colonel, Corps of Engineers. Contract No. DACW 33-79-C-0059 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgement on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on Converse Pond Brook in a rural area of the town of Greenwich, County of Fairfield, State of Connecticut. The dam is shown on the Mount Kisco USGS Quadrangle Map having coordinates latitude N 41° 07.6' and longitude W 73° 38.9'.

b. Description of Dam and Appurtenances - The dam, built around 1900, is a stone and mortar masonry gravity section with an earth fill on the downstream slope. The dam is 175 (excluding the spillway) feet long and 8 feet wide at the top, which is at elevation 426.7 or 30 feet above the streambed of Converse Pond Brook. The upstream slope is a vertical stone masonry face and the downstream slope is inclined at 1.5 horizontal to 1 vertical. There is a 10± foot high dry-laid stone retaining wall which extends from the central portion of the downstream toe to the spillway (See Sheet B-1). The top of the dam is a 6 inch thick concrete cap extending the length of the dam.

There is a series of dikes located along the south shore of the lake approximately two hundred feet to the right (northwest) of the dam (see location plan on Sheet B-1). There are two main dikes which appear to have been designed by an engineer. One dike is constructed similarly to the dam, with an upstream masonry section and a downstream earthfill, and is located closest to the dam or most easterly in the series of dikes. The other is western-most in the series of dikes and is an earth fill embankment with a dry-laid stone retaining wall at the downstream toe. Other smaller earth dikes have been constructed along the south shore to gap the low areas between the two main dikes. The crest elevations of the dikes are irregular with the easterly and westerly dikes at elevation 425.5± and the smaller dikes at elevation 426.5± (see page D-4).

The spillway is a 30 foot long broad-crested weir located at the right end of the dam. The spillway is cut into an outcrop of bedrock, which forms the right spillway training wall. The left spillway training wall is a 2.5 foot high and 40 foot long stone and mortar masonry wall. The crest of the spillway is 5 feet wide, and at elevation 423.5, is 3.2 feet below the top of the dam. A concrete lining has been placed over the rock cut to form the spillway floor. This lining extends 45 feet along the rock cut, from the crest of the spillway to the edge of the bedrock, where there is an 18± foot drop to the downstream channel (See Sheet B-1, Photos 5 and 6).

The outlet works consist of 16 inch (O.D.) and 21 inch (I.D.) cast iron pipes situated one above the other at the central part of the dam, an upper level gate house and a lower level gate house. The 21 inch pipe extends outward 40 inches from the vertical upstream face of the dam approximately 20.3 feet below the top of the dam or at invert elevation 406.4. The 16 inch pipe is located approximately 14.8 (invert) feet below the top of the dam and also

extends 40 inches from the face of the dam. The 16 inch pipe terminates in a 90 degree elbow, from which there extends a short piece of 8 inch (I.D.) pipe. This elbow swivels in a circle so the elevation of the intake can be adjusted. The extension however, is now resting in the downward position so the intake elevation is approximately the same as the 21 inch pipe (See Sheet B-1 and pages B-34, B-39). The 21 inch pipe extends to the upper gate house and control valve, and then terminates just outside the gatehouse at invert elevation 403.3. The 16 inch pipe extends through the upper gate house to the lower gate house just downstream and to the right of the upper gate house. The 16 inch pipe terminates at a 1.5 foot by 2 foot outlet at the base of the lower gate house, elevation 399.7. There are two hand operated control valves for the 16 inch outlet, one in each gate house.

c. Size Classification - (INTERMEDIATE) - The dam impounds 1220 acre-feet of water with the lake level at the top of the dam, which at elevation 426.7, is 30 feet above the streambed of Converse Pond Brook. According to the Recommended Guidelines, a dam with an available storage capacity of 1220 acre-feet is classified as intermediate in size.

d. Hazard Classification - (SIGNIFICANT) - Converse Lake Dam is located in a rural, fairly undeveloped area of Greenwich. There is a potential for economic loss due to failure of the dam where roads cross the stream at 3 locations between 800 and 9000 feet downstream from the dam. For several miles downstream, no permanent residential structures (accessible to the inspection party) were found to be at a low enough elevation as to be in the probable flood path and therefore, to present a potential for loss of life in case of failure of this dam. However, because of the large body of water which will be released upon failure and the corresponding flood which will be generated with subsequent economic loss, the dam has been classified as significant hazard.

e. Ownership - Rosenstiel Estate
Manufacturers Hanover Trust Company (Trustee)
Real Estate Department
600 Fifth Avenue
New York, New York 10020
Mr. V.N. Woolfolk (212)957-1620

The dam was originally owned and built by E.C. Converse around 1900. Mr. Lewis Rosenstiel purchased the property including the dam in 1935. In 1976, Mr. Rosenstiel died and the dam became the property of the Rosenstiel Estate.

f. Operator - Mr. Fredrick Jansen (Estate Superintendent)
(203)661-9168

g. Purpose of Dam - Recreational - The dam was originally built at the same time as an ice house located nearby. The lake is now used solely for recreational purposes, although the Connecticut - American Water Company holds the rights to the water in Converse Lake.

h. Design and Construction History - The following information is believed to be accurate based on the plans and correspondence available. A Mr. E.C. Converse retained the services of S.E. Minor and Company to run a flow line and propose a design for the dam. A tentative design by Leon F. Peck of S.E. Minor and Company was calculated and drawn but this design was evidently abandoned by Mr. Converse. The dam was then constructed by W.J. Smith in 1900, using a similar design for which the engineer is unknown. The dikes are also believed to have been constructed at this time. In 1969, leaks in the dam were packed with lead wool, cracks were sealed with a thin cement-mortar grout and a concrete cap was placed on the top of the stone masonry section of the dam.

i. Normal Operational Procedures - The lake level is normally 3.2 feet below the top of the dam, or at elevation 423.5. The valves are maintained in a closed position and are not operated. The Connecticut-American Water Company of Greenwich, Connecticut maintains water rights to Converse Lake and can divert water from Converse Pond Brook (below the dam) to Putnam Lake through an aqueduct to Horseneck Brook.

1.3 PERTINENT DATA

a. Drainage Area - 1.1 square miles of undeveloped rolling and wooded terrain.

b. Discharge at Damsite - Discharge is over the spillway and through the 16 inch and 21 inch cast iron outlets.

1. Outlet works (conduits):	
16 inch (O.D.) cast iron pipe @ d/s invert el. 399.7	25 cfs (head to top of dam)
21 inch (I.D.) cast iron pipe @ d/s invert el. 403.3	60 cfs (head to top of dam)
2. Maximum reported flood at damsite:	1.5 feet below top of dam (el. 425±) in 1955
3. Ungated spillway capacity @ top of dam el. 426.7:	520 cfs
4. Ungated spillway capacity @ test flood el. 426.0:	360 cfs
5. Gated spillway capacity @ normal pool el. 423.5:	N/A
6. Gated spillway capacity @ test flood el. 426.0:	N/A

7. Total spillway capacity @ test flood el. 426.0:	360 cfs
8. Discharge over dikes @ test flood el. 426.0:	330 cfs
9. Total project discharge @ test flood el. 426.0:	690 cfs

c. Elevations (National Geodetic Vertical Datum based on elevations obtained from an inspection report by Joseph W. Cone dated December 19, 1966).

1. Streambed at toe of dam:	397±
2. Maximum tailwater:	Unknown
3. Upstream portal invert diversion tunnel:	N/A
4. Normal pool:	423.5
5. Full flood control pool:	N/A
6. Spillway crest (ungated):	423.5
7. Design surcharge (original design):	Unknown
8. Top of dam:	426.7
9. Top of dikes:	425.5 (easterly and westerly) 426.5 (southerly)
10. Test flood surcharge:	426.0

d. Reservoir

1. Length of maximum pool:	5000 ft.
2. Length of normal pool:	4800 ft.
3. Length of flood control pool:	N/A

e. Storage

1. Normal pool:	920 Acre-feet
2. Flood control pool:	N/A
3. Spillway crest pool:	920 Acre-feet

4. Top of dam:	1200 Acre-feet
5. Test flood pool:	1150 Acre-feet
f. Reservoir Surface	
1. Normal pool:	94 Acres
2. Flood control pool:	N/A
3. Spillway crest:	94 Acres
4. Top of dam:	102 Acres
5. Test flood pool:	100 Acres
g. Dam	
1. Type:	Stone masonry gravity section with earth embankment
2. Length:	175 feet (not including spillway)
3. Height:	30 feet
4. Top width:	8 feet (concrete cap) 7 feet (original masonry)
5. Side slopes:	Vertical (Upstream) 1.5H to 1V (Downstream)
6. Zoning:	N/A
7. Impervious Core:	N/A
8. Cutoff:	N/A
9. Grout Curtain:	N/A
10. Other:	10 foot high retaining wall at downstream toe
Dikes	
1. Type	earth embankment
2. Length:	640± feet total
3. Height:	4± to 15± feet
4. Top width:	4± to 10± feet
5. Side slopes:	2H to 1V (Upstream) 1.5H to 1V (Downstream)

6.	Zoning:	N/A
7.	Impervious Core:	Unknown
8.	Cutoff:	N/A
9.	Grout Curtain:	N/A
10.	Other:	Stone masonry upstream on easterly dike, dry-laid stone wall downstream on westerly dike.

h. Diversion and Regulatory Tunnel - N/A

i. Spillway

1.	Type:	Broad crest concrete weir
2.	Length of weir:	30 feet
3.	Crest elevation:	423.5
4.	Gates:	N/A
5.	Upstream Channel	N/A
6.	Downstream Channel	18 foot drop to natural streambed
7.	General:	45 foot long concrete lined channel extends from weir crest to end of bedrock downstream with 2.5 foot high stone masonry left training wall.

j. Regulating Outlets - The regulating outlets are the 16 inch and 21 inch cast iron pipes at the center of the dam.

16 inch outlet

1.	Invert:	406.4 (u/s) 399.7 (d/s)
2.	Size	16 inch (O.D.)
3.	Description:	Cast iron pipe extending through upper gate house to lower gate house.
4.	Control Mechanism:	Hand operated valve in the upper and lower gate houses

5. Other:	90^{o} elbow with 8 inch (I.D.) cast iron extension. This elbow swivels around the 16 inch pipe to allow raising or lowering the intake elevation
21 inch outlet	
1. Invert:	406.4 (u/s) 403.3 (d/s)
2. Size:	21 inch (I.D.)
3. Description:	Lower level intake with cast iron pipe extending to upper gate house
4. Control Mechanism:	Hand operated valve in upper gate house
5. Other:	N/A

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of two drawings and a series of inspection reports between 1966 and 1978. One of the drawings is titled "An Approximate Cross Section As Built By W.J. Smith", drawn by S.E. Minor and Company, December 1966 and the other is a tracing with comments by Joseph W. Cone, January 1967. The inspection reports which contain design data are the December 19, 1966 and January 2, 1967 reports by Joseph W. Cone and the Phase I report by Undersea Systems, Inc., in December 1968.

b. Design Features - In general, the drawings and inspection reports indicate the design features indicated previously herein. The drawings, however, do not show the concrete cap which was added in 1969 after recommendations during the Undersea System's "Phase I" study. This cap raised the crest elevation approximately 0.5 feet and widened the top of the dam from 7 feet to 8 feet.

c. Design Data - There are no engineering values, assumptions, test results or calculations available for the original construction of the dam. There are some preliminary design figures on the January 1967 tracing which were computed by Leon F. Peck of S.E. Minor and Company.

2.2 CONSTRUCTION

a. Available Data - There are no inspection records for the original construction of the dam or subsequent repair and addition of a concrete cap (See pages B-40, 41). There is a drawing dated December 27, 1966 by S.E. Minor and Company which is titled "Approximate Cross Section of Converse Dam As Built By W.J. Smith."

b. Construction Considerations - No information is available.

2.3 OPERATIONS

Lake level readings are not taken at any specific intervals. According to the operator, the dam spillway has never been exceeded and the highest surcharge was to 1.5 feet below the top of the dam. No formal operation records are known to exist.

2.4 EVALUATION

a. Availability - Existing data was provided by the Connecticut Department of Environmental Protection and S.E. Minor and Company. The owner made the project available for visual inspection.

b. Adequacy - The limited amount of detialed engineering data available was generally inadequate to perform an in-depth assessment of the dam, therefore, the final assessment of this dam must be based primarily on visual inspection, performance history, hydraulic computations of spillway capacity and approximate hydrologic judgements.

c. Validity - A comparison of record data and visual observations reveals no observable significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The general condition of the project is poor. The inspection revealed many areas requiring maintenance and monitoring. At the time of the inspection the reservoir level was at elevation 423.7, i.e. 3 feet below the top of the dam, with water flowing over the spillway.

b. Dam

Crest - The top of the dam is a concrete cap and is in good condition (Photo 1). Minor spalling of the concrete was observed on the upstream edge of the left portion of the crest.

Upstream Slope - No displacement of the stone masonry was noted on the upstream slope although there are a number of cracks in the mortar joints of the dam.

Downstream Slope - The slope is covered by grass and brush, especially in the area of the retaining wall (Photos 2, 3 and 7). Several large stumps were observed on the slope (Photos 2 and 3). The slope inclination is irregular with a number of small depression areas on various portions of the slope.

The stone retaining wall is in poor condition with a number of displaced stones and a bulge at the base of the wall. Also, the wall alignment seems to be shifted out of plumb. Brush cut from the slope was piled almost to the top of the wall (Photo 7), limiting visual inspection.

There is an extensive seepage stream at the toe of the retaining wall near the right side of the lower gate house (Photos 3 and 8). An estimate of this seepage flow is approximately 1/2 to 1 cubic feet per second (cfs). An evaluation of the difference in spillway discharge between Converse Lake dam and the old mill dam (250 feet downstream) reveals a substantial difference in flows and large quantities of seepage.

c. Dikes

Crest - Some displacement and cracking along the mortar joints was noted in the masonry wall of the eastern-most dike (Photo 11). The crest elevation of the dikes varies from 425.5 at the eastern and western-most dikes to 426.5 at the central section of dikes.

Upstream Slope - The upstream slopes of the dikes do not have riprap protection. Some erosion zones were noted in several areas along these slopes.

Downstream Slope - The downstream slopes of the dikes are irregular and all have a grass and shrub cover except for the western dike, which has a dry-laid stone retaining wall, (Photo 12). This wall is in poor condition. Wet areas were observed at the toe of two of the dikes. A seepage stream was noted at the eastern dike (the flow is approximately 1 to 2 gallons per minute) and a ponded and swampy area was observed along the western portion of dikes (Photo 12).

Generally, the dikes are in fair to poor condition with a heavy growth of brush and fairly large trees (Photos 11 and 12).

Spillway - Large areas of spalling were noted in the concrete lining of the spillway channel floor. The floor of the spillway is obstructed by brush and small trees (Photo 5) and the left masonry training wall has several cracks in the mortar joints. Various obstructions including dead trees, brush and large boulders were noted at the spillway discharge channel (Photo 6).

d. Appurtenant Structures - The upper and lower gate houses are in fair to poor condition (Photos 2, 3 and 4). Leakage from an elbow on the 16 (O.D.) inch outlet pipe was observed in the upper gate house. The 21 inch (I.D.) outlet at the upper gate house is plugged with soil; enough so that only the top half of the pipe was visible (Photo 4). The outlet for the 16 inch pipe in the base of the lower gate house is blocked completely by a metal sheet. A seepage flow of 4 to 8 gpm was noted at the base of the lower gate house. This flow appears to be connected with a common seepage stream through the dam in this area.

e. Reservoir Area - The area surrounding the reservoir is generally wooded, hilly and undeveloped.

f. Downstream Channel - The downstream channel is a small pond formed by a small abandoned mill dam (Photo 10), and below this dam is the natural streambed of the Converse Pond Brook. It is mostly undeveloped, steep-sided and wooded to the potential impact area.

The old mill dam is a dry-laid masonry gravity structure which is in very poor condition. Evidence of horizontal movement was observed at the downstream side of the right end of the dam. The maximum horizontal displacement is approximately 2 feet with this portion of the dam being supported by a log post (Photo 9).

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being generally in poor condition. The following features which could influence the future condition and/or stability of the project were identified.

1. An extensive and concentrated seepage stream through the central portion of the dam with a rate of ½ to 1 cfs could create a dangerous condition for the dam safety. Also, the existing quantity of seepage indicates that repair to the dam in 1969 has had minor influence in reducing the seepage flow.

2. The stone retaining wall at the toe of the dam has substantial deterioration and an irregular alignment. Failure of this wall would decrease the stabilty of the dam.

3. Seepage and wet areas at the toe of the dikes could expand and create additional problems in the safety of these structures.

4. The outlet works of the dam (at the upper and lower gate houses) are practically inoperable and will not be sufficient as reservoir drawdown facilities.

5. The pond created by the old mill dam prohibits inspection for seepage at the toe of Converse Lake dam.

SECTION 4: OPERATIONAL PROCEDURES

4.1 REGULATING PROCEDURES

There are no specified procedures for regulating the flow or lake level. The outlets are kept in a closed position. The Connecticut-American Water Company has rights to the water in Converse Lake, which is normally drawn from Converse Pond Brook at a location downstream from the dam. But, in extremely dry seasons when there is no flow over the spillway, water has to be released from Converse Lake through the upper and lower outlets. The operator of the dam reported that the last time this was done was 12± years ago.

4.2 MAINTENANCE OF DAM

The brush and trees are cut from the downstream slope of the dam by Mr. Jansen, the estate superintendent.

4.3 MAINTENANCE OF OPERATING FACILITIES

There is no known regular maintenance of the operating facilities.

4.4 DESCRIPTION OF ANY FORMAL WARNING SYSTEM

No formal warning system is in effect.

4.5 EVALUATION

The operation and maintenance procedures are generally poor with several areas requiring improvement. A formal program of operation and maintenance procedures should be implemented by the owner, including documentation to provide complete records for future reference. Also, a formal warning system should be developed and implemented within the time period indicated in Section 7.1c. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. General - The watershed is 1.1 square miles of undeveloped, rolling and wooded terrain. The dam is a stone and mortar masonry gravity section with an earth fill on the downstream slope. A series of dikes, which range in elevation from 425.5 to 426.5, are located along the south shore of the lake several hundred feet to the right of the dam. The available surcharge storage provided by the dam and dikes will reduce the Probable Maximum Flood (PMF) from 2500 cfs to 1790 cfs (a 28% reduction) and the ½ PMF from 1250 cfs to 690 cfs (a 45% reduction).

b. Design Data - No computations could be found for the original dam construction of the dam or dikes.

c. Experience Data - As reported by the operator, the dam has never been overtopped and the highest lake level was 1.5± feet below the top of the dam (elevation 425±) in 1955.

d. Visual Observations - Brush and small trees were noted in the spillway and downstream channel. The top of the dikes are not the same elevation in relation to each other, and they are lower than the top of the dam. The outlet facilities are in need of repair.

e. Test Flood Analysis - Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March 1978, the watershed classification (rolling) and area (1.1 square miles), a Probable Maximum Flood (PMF) of 2500 cfs, or 2300 cfs per square mile, is expected at the dam site. In accordance with the size (intermediate) and hazard (significant) classification, the test flood range to be considered is ½ PMF to the PMF. For Converse Lake Dam the test flood is considered to be equivalent to the ½ PMF.

Peak inflow to the lake at the ½ PMF is 1250 cfs (Appendix D-1) and the peak outflow is 690 cfs with the lake level to within 0.7 feet of the top of the dam (Appendices D-5 and D-12). Of the total outflow, 360 cfs are released over the spillway and 330 cfs are passed over the dikes. If the dikes are raised to the same elevation as the top of the dam, the test flood elevation would rise to 426.7. The spillway capacity with the water level to the top of the dam is 520 cfs. The outlet discharge capacities with the head to the top of dam are 60 cfs through the 21 inch (I.D.) pipe and 25 cfs through the 16 inch (O.D.) pipe. These capacities were not considered in the total outflow computations.

Peak inflow to the lake at the PMF is 2500 cfs and the peak outflow is 1790 cfs with a freeboard to the top of the dam of 0.1 feet (water surface elevation 426.6). The spillway capacity at this elevation would be 490 cfs and flow released over the dikes would be 1300 cfs.

f. Dam Failure Analysis - The dam failure analysis is based on the Army Corps of Engineers' April, 1978 "Rule of Thumb Guidance for Downstream Dam Failure Hydrographs", and is assumed to occur at test flood surcharge conditions (el. 426.0 NGVD). Just before failure of the dam the peak discharge in Converse Pond Brook would be 690 cfs and the peak failure outflow from the dam breaching would be 11,000 cfs. A breach of the dam would result in a rise of 2.5 feet in the water level of the stream at the initial impact area, which corresponds to an increase in the water level from a depth of 0.8 feet just before the breach, to a depth of 3.3 feet just after the breach.

The dam is located in a rural area of the Town of Greenwich. There is potential for economic loss due to failure of the dam where roads cross the stream at 3 locations between 800 and 9000 feet downstream from the dam. For several miles downstream, there were no permanent residential structures found which were at a low enough elevation above the streambed of Converse Pond Brook so as to be in the probable flood path and therefore, constitute a potential for loss of life should the dam at Converse Lake fail. However, because of the large body of water which would be released upon failure of the dam, and the corresponding flood which would be generated with subsequent economic loss, the dam has been classified as significant hazard.

If the dikes are raised to the top of dam, elevation 426.7, the total outflow in case of failure of the dam would not be reduced significantly and the failure conditions downstream would be approximately the same as allowing water over the dikes. If failure of the dikes were to occur, (water surface elevation 425.5±), the expected failure condition would be less severe as the dike of maximum height is 15± feet and the expected maximum outflow would be reduced to less than 4500 cfs.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The visual inspection did not reveal any indications of immediate stability problems. There are areas of substantial seepage and deterioration, as described in Section 3, however they are not considered stability concerns at the present time.

b. Design and Construction Data - The drawings and data available and listed in Appendix B were not sufficient to perform an in-depth analysis and assessment of the structural stability of the project.

c. Operating Records - The operating records do not include any indications of dam instability since its construction in the early 1900's. There were problems with seepage as indicated in the data in Appendix B. Corrective measures were taken and the seepage was not considered to be a pressing stability problem, although it was to be monitored periodically.

d. Post-Construction Changes - The post-construction changes of the project include the following work which was performed during the dam repair in 1969:

1. Placement of a new concrete cap over the crest of the dam.

2. Filling of cracks in the upstream masonry face of the dam with lead wood and cement-mortar for seepage reduction.

e. Seismic Stability - The project is in Seismic Zone 1 and according to the Recommended Guidelines, need not to be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 PROJECT ASSESSMENT

a. Condition - Based on the visual inspection of the site and past performance, the project appears to be in poor condition. No evidence of immediate structural instability was observed in the dam, dikes, spillway or appurtenant structures. However, the dam and dikes are generally in poor condition with areas requiring repair, maintenance and monitoring.

Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, and hydraulic/hydrologic computations, the peak inflow to the reservoir at the test flood is 1250 cfs and the peak outflow is 690 cfs with the water level of the lake 0.7 feet below the top of the dam. The spillway capacity at test flood elevation is 360 cfs and at top of dam is 520 cfs.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the project must be based solely on visual inspection, past performance and sound engineering judgement.

c. Urgency - It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within one year of the owner's receipt of this report except where otherwise noted.

7.2 RECOMMENDATIONS

It is recommended that further studies be made by a registered professional engineer qualified in dam design and inspection pertaining to the following:

1. Dismantling and removal of the old mill dam in the downstream channel within 6 months of the owners' receipt of this report. Removal of the dam will permit lowering of the water level at the toe of the dam to expose possible seepage at future inspections.

2. Development of a program for monitoring of seepage through the dam and dikes within 6 months of the owner's receipt of this report.

3. A detailed hydraulic/hydrologic analysis to determine the feasibility for one or more of the dikes to be used as an overflow section or raising the dikes to the same elevation as the top of the dam. Recommendations should be made by the engineer and implemented by the owner.

4. Gating the outlet facilities on the upstream side of the dam to eliminate pressures in the pipes within the embankment.

5. Removal of trees 4 inches or greater in diameter from the slopes and top of the dam and dikes. Removal of the trees should include their root systems and backfilling with a suitable material.

6. A comprehensive program for further investigation of the project. Items of particular importance are as follows:

   a. Implementation of a material testing program and piezometer installation to assess the permeability of the dam and it's foundation and to determine the origin and quantity of seepage.

   b. Evaluation of the condition of the 16 and 21 inch pipes through the dam. These pipes could be deteriorated and produce additional seepage flow through the dam.

   c. Reinforcement of the stone masonry retaining wall at the downstream slope of the dam.

   d. Evaluation of origin and significance of seepage and wet areas at the toe of the dikes.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken by the owner within the time period indicated in Section 7.1.c, and continued on a regular basis.

1. Round-the-clock surveillance should be provided by the owner during periods of heavy precipitation or high project discharge. The owner should develop and implement a downstream warning system to be used in case of emergencies at the dam.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference. This should include exercising and greasing the outlet valves at least twice a year, cutting the grass and brush on the dam and dikes, clearing the spillway and discharge channel of debris, and a periodic check and repair of all the stone masonry structures.

3. A comprehensive program of inspection by a registered professional engineer qualified in dam inspection should be instituted on an annual basis.

4. Cracks and erosion in the spillway and training wall should be repaired to prevent further deterioration of this structure.

5. The leaking 16 inch pipe in the upper gate house should be sealed or replaced. The outlets from the upper and lower gate houses should be opened and cleaned of any obstructions.

6. The gate houses should be repaired as needed including a new roof and door on the lower gate house, locks to prevent vandalism and sealing any cracks in the stone and mortar masonry.

7. An outlet channel from the upper gate house to the downstream discharge channel should be constructed. This should include lining the channel with suitable material to prevent erosion of the channel or the downstream toe of the dam during discharge from the outlet pipe.

7.4 Alternatives

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Converse Lake Dam DATE: November 5, 1979

TIME: 1:00 - 3:30 p.m

WEATHER: Sunny, 55° F

W.S. ELEV. 4237 U.S. ____ DN.S

PARTY:	INITIALS:	DISCIPLINE:
1. Peter M. Heynen	PMH	Geotechnical
2. Miron Petrovsky	MP	Geotechnical
3. Jay Costello	JC	Geotechnical
4. Hector Moreno	HM	Hydraulic/Hydrologic
5. Moshe Norman	MN	Survey
6. Fredrick Jansen	F.J.	Owner Representative

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Masonry Dam	PMH, MP, JC, HM, F.J, MN	
2.	Dike	PMH, MP, JC, HM, MN	
3.	Upper Gate House	PMH, MP, JC	
4.	Lower Gate House	PMH, MP, JC	
5.	Upper Level Outlet	PMH, MP, JC, HM	
6.	Lower Level Outlet	PMH, MP, JC	
7.	Masonry Spillway	PMH, MP, JC, HM, MN, FJ	
8.	Old Mill Dam	PMH, MP, JC	
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 1979

PROJECT FEATURE Masonry Dam BY PMH, MP, JC, HM, MN FJ

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	426.7 ±
Current Pool Elevation	423.7 ±
Maximum Impoundment to Date	Unknown
Surface Cracks	Minor, on U/S slope
Pavement Condition	Concrete, minor spalling
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	Appears good
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	Irregular d/s slope
Trespassing on Slopes	None observed
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection-Riprap Failures	N/A
Unusual Movement or Cracking at or Near Toes	Slight horiz. movement of d/s stone retaining wall
Unusual Embankment or Downstream Seepage	Seep. stream at central portion of toe of dam w/flow no less than 1 cfs
Piping or Boils	None observed
Foundation Drainage Features	N/A
Toe Drains	
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 1979

PROJECT FEATURE Dikes BY PMH, MP, JC, HM

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	425.5±, east & west sections 426.5±, southern section
Current Pool Elevation	423.5±
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	Grass & top of stone wall
Movement or Settlement of Crest	None observed
Lateral Movement	
Vertical Alignment	Appears good
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None observed
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection-Riprap Failures	Grass cover
Unusual Movement or Cracking at or Near Toes	None observed
Unusual Embankment or Downstream Seepage	Wet & swamp areas at toe, seep w/ flow of 1-2gpm at south section
Piping or Boils	None observed
Foundation Drainage Features	
Toe Drains	N/A
Instrumentation System	
Trespassing on Slopes	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 1979

PROJECT FEATURE Upper Gate House BY PMH, MPJC, HM

AREA EVALUATED	CONDITION
OUTLET WORKS-CONTROL TOWER	
a) Concrete and Structural	Stone masonry structure
General Condition	Poor
Condition of Joints	N/A
Spalling	None observed
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	n/A
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	
Rusting or Corrosion of Steel	n/A
b) Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	N/A
Elevator	
Hydraulic System	
Service Gates	16" and 18" gate valves. Leaks from elbow of 18" pipe.
Emergency Gates	
Lightning Protection System	N/A
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 1979

PROJECT FEATURE Lower Gate House BY PMH, MP, JC

AREA EVALUATED		CONDITION
OUTLET WORKS-CONTROL TOWER		
a) Concrete and Structural		Stone Masonry House
General Condition		Poor
Condition of Joints		N/A
Spalling		None observed
Visible Reinforcing		
Rusting or Staining of Concrete		
Any Seepage or Efflorescence		Seepage at toe of base w/flow = 4-8 gpm
Joint Alignment		N/A
Unusual Seepage or Leaks in Gate Chamber		Not observed
Cracks		None observed
Rusting or Corrosion of Steel		
b) Mechanical and Electrical		
Air Vents		
Float Wells		
Crane Hoist		N/A
Elevator		
Hydraulic System		
Service Gates		16" gate valve
Emergency Gates		
Lightning Protection System		N/A
Emergency Power System		
Wiring and Lighting System		

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 979

PROJECT FEATURE Upper Level Outlet BY PMH, NP, JC, HM

AREA EVALUATED	CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL	18" C.I. pipe at Upper Gatehouse
General Condition of Concrete	Poor, 15" pipe outlet clogged by soil
Rust or Staining	N/A
Spalling	
Erosion or Cavitation	None observed
Visible Reinforcing	N/A
Any Seepage or Efflorescence	None observed
Condition at Joints	N/A
Drain Holes	
Channel	None observed
Loose Rock or Trees Overhanging Channel	Trees overhanging at area running from outlet to toe of dam
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 1979

PROJECT FEATURE Lower Level Outlet BY PMH, MP, JC

AREA EVALUATED	CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL	1.5' x 1.7' outlet in masonry base of Lower Gate House.
General Condition of Concrete	Poor, outlet plugged by metal sheet
Rust or Staining	N/A
Spalling	Some
Erosion or Cavitation	Not observed
Visible Reinforcing	N/A
Any Seepage or Efflorescence	Seepage at toe of masonry
Condition at Joints	N/A
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	Some
Condition of Discharge Channel	Fair

PERIODIC INSPECTION CHECK LIST

PROJECT Converse Lake Dam DATE Nov. 5, 1979

PROJECT FEATURE Masonry Spillway BY PMH, MP, JC, HM, MN FJ

AREA EVALUATED	CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a) Approach Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Some
Floor of Approach Channel	Natural ground
b) Weir and Training Walls	
General Condition of Concrete	Fair
Rust or Staining	N/A
Spalling	Some, d/s face and train wall
Any Visible Reinforcing	N/A
Any Seepage of Efflorescence	None observed
Drain Holes	N/A
c) Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Some
Floor of Channel	Natural ground
Other Obstructions	Boulders and toppled trees

PERIODIC INSPECTION CHECK LIST

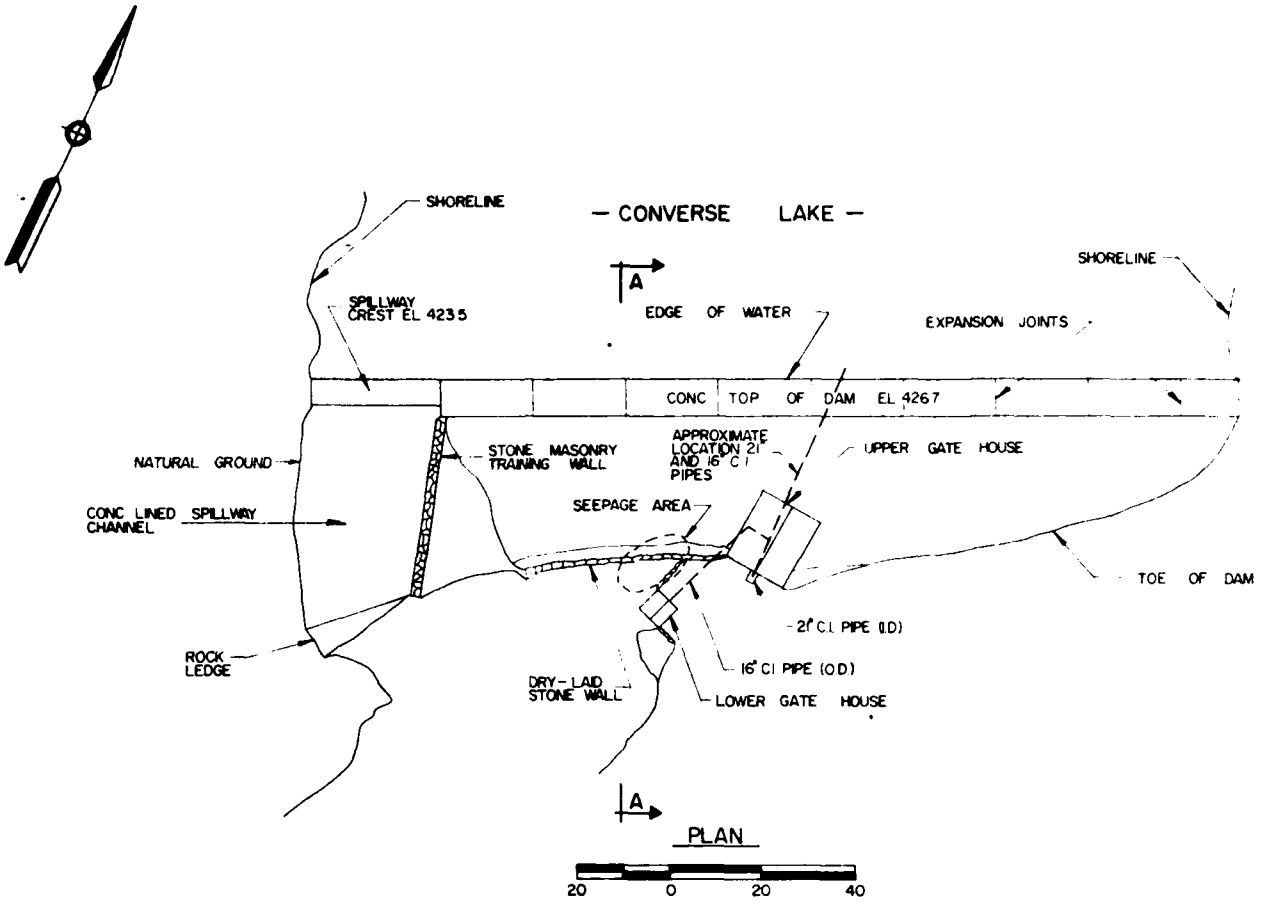
PROJECT Converse Lake Dam DATE Nov 5, 1979

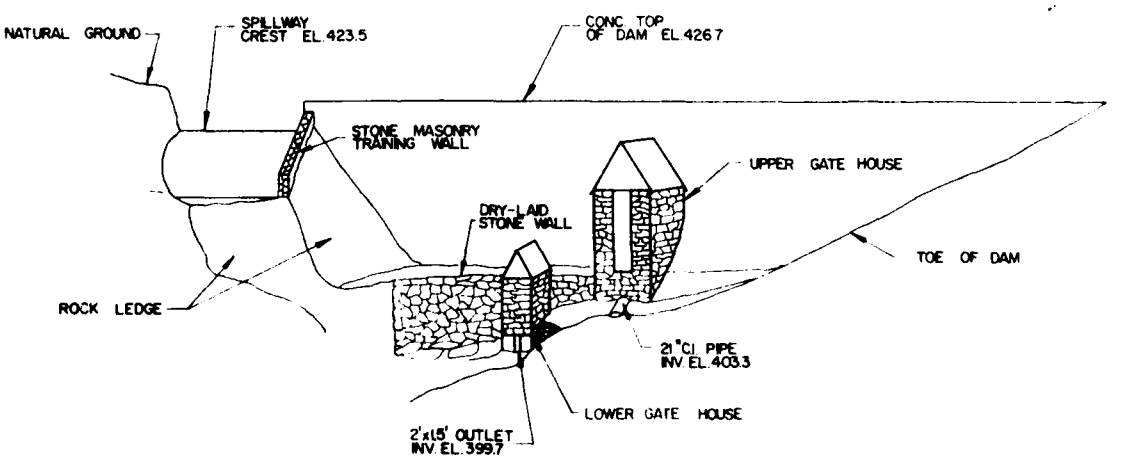
PROJECT FEATURE Old Mill Dam BY PMH, MP, JC

AREA EVALUATED		CONDITION
DAM EMBANKMENT		Masonry gravity structure
Crest Elevation		398 ±
Current Pool Elevation		396 ±
Maximum Impoundment to Date		Unknown
Surface Cracks		Some
Pavement Condition		N/A
Movement or Settlement of Crest		Not observed
Lateral Movement		2' ±, left side of d/s slope
Vertical Alignment		Irregular
Horizontal Alignment		
Condition at Abutment and at Concrete Structures		Good
Indications of Movement of Structural Items on Slopes		N/A
Trespassing on Slopes		Not observed
Sloughing or Erosion of Slopes or Abutments		Eroded d/s slope
Rock Slope Protection-Riprap Failures		N/A
Unusual Movement or Cracking at or Near Toes		Not observed
Unusual Embankment or Downstream Seepage		
Piping or Boils		
Foundation Drainage Features		N/A
Toe Drains		
Instrumentation System		

APPENDIX B

ENGINEERING DATA AND CORRESPONDENCE





ELEVATION

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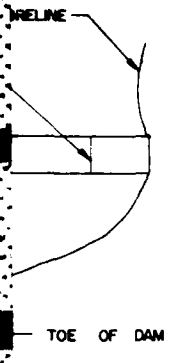
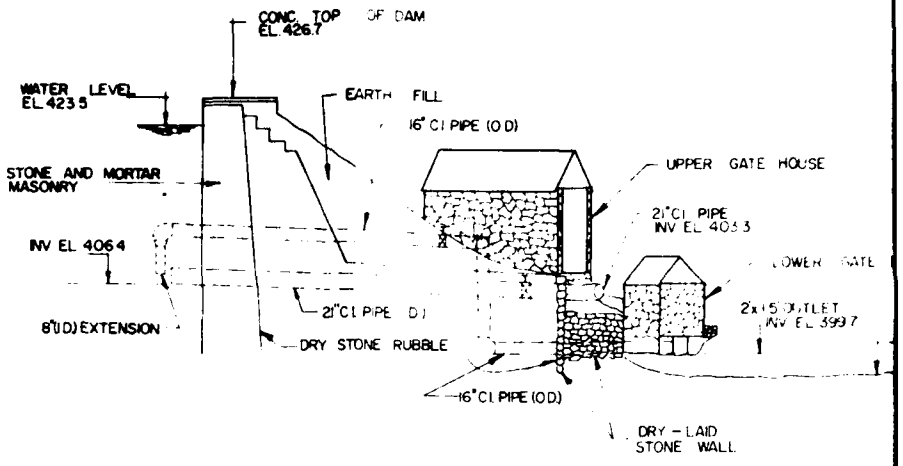
VERTICAL 10 0 10 20





SECTION A-A

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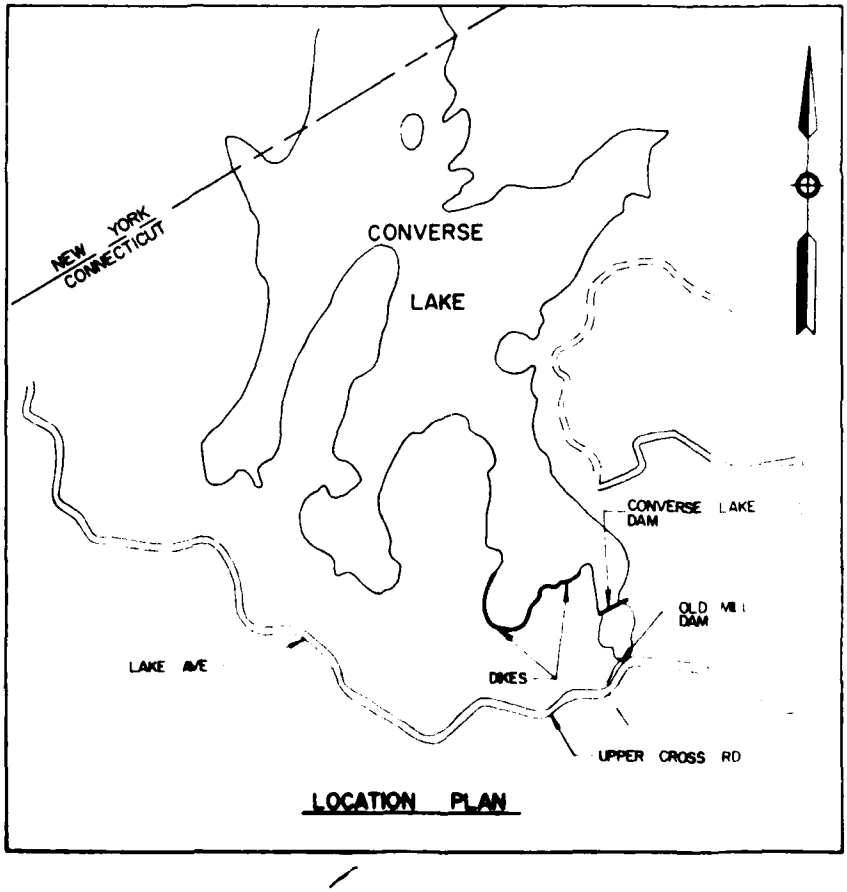

LOCATION PLAN

NOTES:

1. THIS PLAN WAS COMPILED FROM EXISTING APPROXIMATE CROSS SECTION OF CONVERSE BY S.E. MINOR AND CO., 1966 AND SUPPLEMEN SURVEY BY CAHN ENGINEERS, NOVEMBER 197
2. ALL ELEVATIONS ARE N.G.V.D. BASED ON TAKEN FROM AN INSPECTION REPORT BY J. DECEMBER 19, 1966
3. THE DIKES ARE LOCATED APPROXIMATELY 50 OF THE DAM AND ARE NOT SHOWN IN DE PLAN.

CAHN ENGINEERS INC. WALLINGFORD, CONNECTICUT ENGINEER	U.S. ARMY ENGINEE CORPS O WALTH

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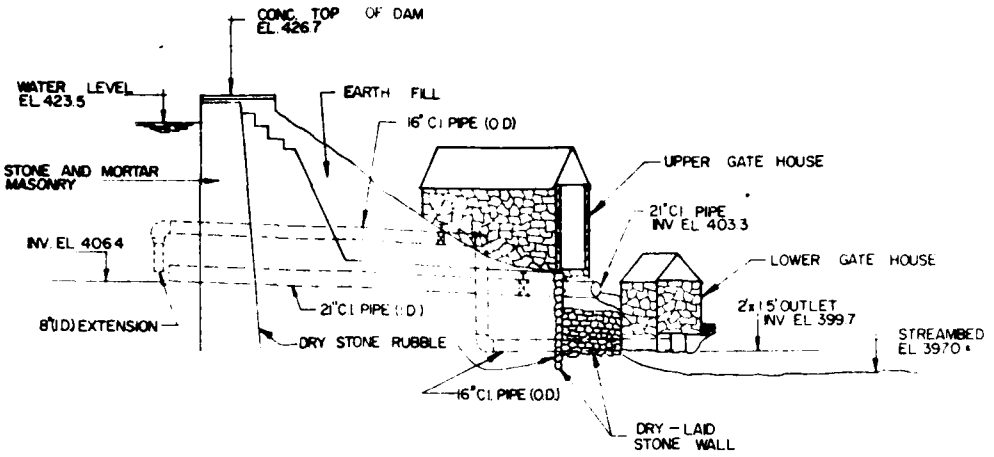

SECTION A-A

(H & V)

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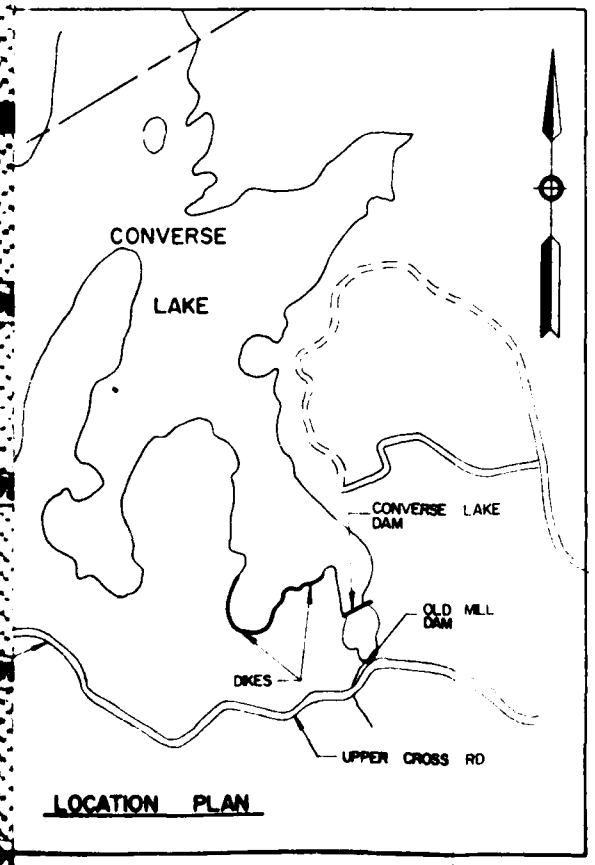


LOCATION PLAN

NOTES:

1. THIS PLAN WAS COMPILED FROM EXISTING DRAWING "APPROXIMATE CROSS SECTION OF CONVERSE DAM" BY S.E. MINOR AND CO., 1966 AND SUPPLEMENTARY SURVEY BY CAHN ENGINEERS, NOVEMBER 1979
2. ALL ELEVATIONS ARE N.G.V.D. BASED ON MSL ELEVATIONS TAKEN FROM AN INSPECTION REPORT BY JOSEPH W. CONE, DECEMBER 19, 1966
3. THE DIKES ARE LOCATED APPROXIMATELY 500' NORTHEAST OF THE DAM AND ARE NOT SHOWN IN DETAIL ON THIS PLAN.

CAHN ENGINEERS INC WALLINGFORD, CONNECTICUT ENGINEER	U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PLAN, ELEVATION AND SECTION

CONVERSE LAKE DAM

CONVERSE POND BROOK GREENWICH, CONNECTICUT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE AS NOTED

(3)

CONVERSE LAKE DAM

EXISTING PLANS

"Approximate Cross Section of Converse
Dam as Built by W. J. Smith"
S.E. Minor and Company
Greenwich, Conn.
December, 1966
1 Sheet

Tracing of Preliminary Design with Comments
Joseph W. Cone
Greenwich, Conn.
January, 1967
1 Sheet

SUMMARY OF DATA AND CORRESPONDENCE

DATE	TO	FROM	SUBJECT	PAGE
Jan. 17, 1969	William H. O'Brian III, Water Resources Commission	Francis X. Lennon, Jr. Heagney, Lennon and Nigro, Attorneys at Law	Report of diver's inspection by Undersea Systems, Inc.	B-32
May 19, 1969	Water Resources Commission	A. J. Macchi, Macchi and Hoffman, Engr.	Procedure for inspection by divers and recommendations for repair work	B-40
April 30, 1970	Francis X. Lennon, Jr. Heagney, Lennon and Nigro, Attorneys at Law	William H. O'Brian, III Water Resources Commission	Recognition of repair work done on dam	B-42
June 7, 1971	William H. O'Brian, III Water Resources Commission	A. J. Macchi Macchi and Hoffman, Engr.	Dam inspection report	B-43
April 11, 1972	File	Victor F. Galgowski Water Resources Commission	Dam inspection report	B-44
No Date	File	Water Resources Commission	Inventory Data	B-45

NEW YORK LICENSE 4755
CONNECTICUT REGISTRATION 4

JOSEPH W. CONE
CIVIL ENGINEER
124 HAVEMEYER PLACE
GREENWICH, CONNECTICUT
06830

TELEPHONE
TOWNSEND 9-2152

December 19, 1966

Mr. William P. Sander
Water Resources Commission
State Office Building
Hartford 15, Conn.

Re: Dam #43 Converse Lake
Greenwich, Conn.

Dear Mr. Sander:

In response to your letters of Feb. 15, and Aug. 29, I first went to the dam in early summer. At that time, water was down several feet below FL. There were two small leaks at the blow-off valve house, shown approximately on enclosed sketch plan and in Photo #8. Because of dense foliage I did not examine the main dam or the two dikes.

I decided to wait until reservoir was full, or nearly full, and when leaves were off brush and trees. On Dec. 11th, the dam and dikes were inspected and rough measurements made as shown on the plan and sections sheet enclosed. Reservoir was down about 8 inches. The 9 photos enclosed tell the story. In my opinion there are other conditions that are pertinent, in addition to the leaks.

Comments re Photos

1. Portion of Dike #2 looking N.E. Note growth of trees on earth embankment. Masonry wall not well defined. This dike not as high above natural ground as Dike #1. Difficult to determine limit of natural ground.

2. Another portion of Dike #2, shows large trees. General remarks same as (1). Lake on left.
3. Dike #1 looking East. Masonry wall well defined. Abutments both ends ledge rock. Note large trees. Much higher than Dike #2. Again difficult to determine limit of natural ground. Lake is on left.

   Slight seepage below each dike estimated at less than one gallon per minute for each dike; water level in lake 8" below FL.
4. General view of main Dam #1. Masonry facing wall excellent job. Note large trees.
5. View looking east. Spillway in foreground.
6. Spillway. 30' x 2.7'. Note growth in spillway channel.
7. Outlet of spillway chute. Note solid ledge rock; also fallen trees blocking channel.
8. Downstream view of Dam #1. Shows retaining wall at toe, (Remember Norwich Dam) blow-off valve house (L), and service valve house (R). Note large trees growing on earth embankment.
9. Old mill pond dam - Dam #2 - below main dam. Back water shows in Photo #8. Note that top was eroded during 1955 flood, consequently El. 486.5 shown on the Town's topo map is not now correct. Construction probably same as usual New England mill pond; dry wall, plank tight line, earth fill.

Old tail race shows in ruins of old mill building. Flow line from this dam backs up to toe of Dam #1 making it difficult to evaluate leaks in main dam; volume and whether or not sediment in flow.

Leaks

At each dike there is slight seepage estimated at about one gallon per minute on December 11th.

At the main dam #1 there are two leaks, one at south side of blow-off valve house and one at west side. Flow of water is audible back of east end of dry masonry toe wall. Because of backwater from Dam #2 it is difficult to estimate volume of flow and whether or not sediment is being carried.

Flow appeared to be slightly greater on Dec. 11th than it was on my first trip. I estimated combined flow on Dec. 11th at about 4 gal. per min. I did not detect sediment being carried.

Dikes

The dikes are similar in construction to the main dam, though on a smaller scale. In the photos you will note large trees on the dikes. They should be removed.

Spillway

In photos #5 & #6 note that trees are growing in the spillway channel. Evidently during a severe storm, branches and other debris will collect and capacity of the spillway will be seriously reduced. Channel should be cleared of all growth and debris.

Right side of spill-channel is ledge rock. Left side there is a training wall of rubble masonry, cement mortar on channel face, dry wall on back.

Estimated Run-off.

By $Q = 9 A^{2/3}$ graph Q 25 normal = 750 cfs for 740 Ac

Pres. 100 yr Qd	= RF x LF x FF x Q	
	= 1 x 0.4 x 1.8 x 750	= 540 cfs
" 400 yr	= 1 x 0.4 x 3.8 x 750	=1140 "
2000 AD-100	= 1 x 0.6 x 1.8 x 750	= 810 "
" 400	= 1 x 0.6 x 3.8 x 750	= 1310 "

Mr. Rosenstiel owns about 1500 acres. Nearly all of the watershed tributary to this dam of 740 Ac is owned by him. It is reasonably certain that by 2000 AD this area will be subdivided into about 4 Ac tracts, situated as it is in the New York Metropolitan area and particularly attractive. At present there are practidally no buildings or highways on the watershed.

When one considers storage capacity based on the very favorable Watershed-Reservoir area ratio of about 7 to 1 and an H of about 3' it is evident that the present spillway for present conditions is adequate, provided the spillway-channel is cleared of all growth and debris. However when more intensive land use occurs in the future, the hydraulics of the present spillway should be thoroughly examined.

Trees

The photographs give sufficient evidence of large tree growth on the dam and dikes. We all know that large trees present

a definite hazard to earthen dams and dikes. All trees over 3" in diameter, breast high, should be removed.

Dam #1

The main dam is about 175' long plus end spillway of 30'. It is a combination of stone masonry with very steep earth backing overgrown with trees, large and small. There is a dry rubble toe wall about 10' high. Refer to photos Nos. 4, 5, 6, 8. If the masonry portion is not substantial the dam is not safe.

Masonry on water side is a good job of cement rubble. Top width is 7'. But it is doubtful if entire section is cement rubble. (See cross section). We dug into earth embankment at one spot and found dry wall masonry backing.

In addition there are longitudinal cracks parallel to face of dam and signs of settlement, or of frost action, tending to separate backing from face or vice versa.

To obtain copies of possible plans, I have written to two old engineering firms trusting plans may be located; copy of one letter is enclosed. A final decision as to the main dam will depend on this additional information. Meanwhile top of dam should be made waterproof to prevent freezing effect insomuch as is possible.

I estimate the capacity of this reservoir at FL as over 300,000,000 m.g. If the dam should fail the damage to highways and property along the Byram River East Branch would be very considerable and with possible loss of life in lower reaches of the Byram River.

Pending more information concerning details of construction of the main dam my present recommendations follow:-

Recommendations

1. That the owner immediately instruct his estate superintendent, Mr. Leonard, to inspect the leaks at the main dam (dam #1) at least twice weekly and to note whether or not:-
   (a) Flow is increasing.
   (b) Sediment is carried by the flow.
   If either occurs to notify your Commission at once.
2. Immediately clear spillway-channel of all growth and debris.
3. Within one year remove all trees more than 3" diameter, breast high, from Dam #1 and Dikes #1 & #2.(*)
4. Weatherproof top of present dam.
5. See to it that the present blow off and service valves are not frozen and are in working order.
6. Suggest to the owner that he employ a professional engineer particularly competent in estimating of flood flows and dam construction. One who is a PE in chemistry or electrical or industrial engineering, etc., not necessarily acceptable.

   The owner to protect his own interests, not only for the scenic value to his property of Converse Lake but from substantial damage lawsuits, should the dam fail, should welcome this suggestion.

7. Said engineer should study and recommend as to the following:

(a) Determine heights of Dikes #1 & #2 relative to Dam #1.

(b) For future design whether to

(1) Raise Dam #1 & Dikes #1 & #2 or

(2) Widen present spillway or

(3) Convert Dike #2 into an emergency relief spillway.

(c) Advise lowering Dam #2 so that leaks at Dam #1 can be more definitely observed.

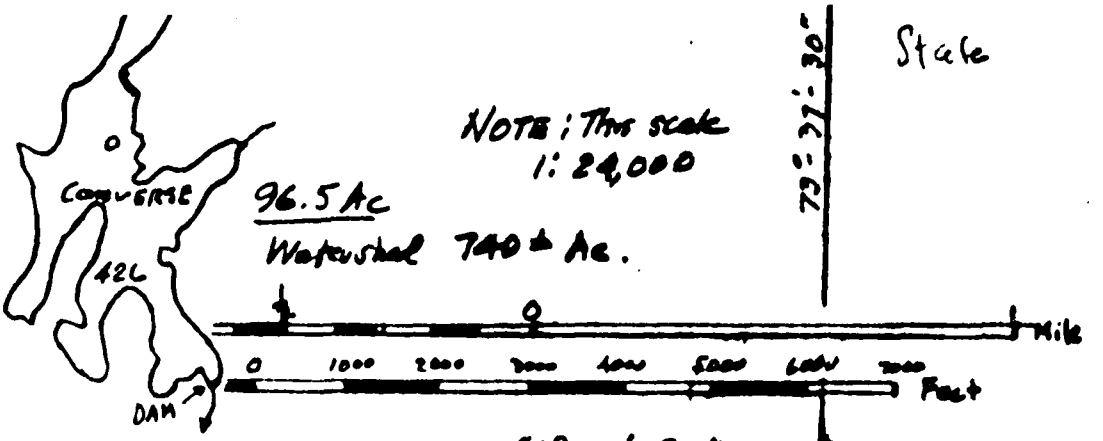
(d) Safety of present dam.

Yours very truly,

J. W. Cone

JWC/dr

Enclosures:
1. Photos-9
2 Map watershed 1:24000
3 Capacity worksheet
4 B.P.Roads Runoff graph
5 Sketch Plan & Sections of Dam
6 Letter to Engineering Firm
7 Site topo. 1"= 200'



Rockwood 0.55 sq in

$\frac{3}{59}$ 1.77 × 160 = 94.4 Ac

Storage $\frac{500}{7.48}$ mg = 66,800,000 cu. ft = 4,100,000 sq. ft

~~5,600,000~~ / ~~4,100,000~~ = 16.3' Aver depth

Putnam 0.60

$\frac{3}{59}$ 1.78 × 160 = 94.5 Ac

= 4,100,000 sq. ft

Storage $\frac{570}{7.48}$ m.g. = $\frac{76,200,000}{4,130,000}$ cu. ft = 18.5 Aver depth

But both dams higher than Converse

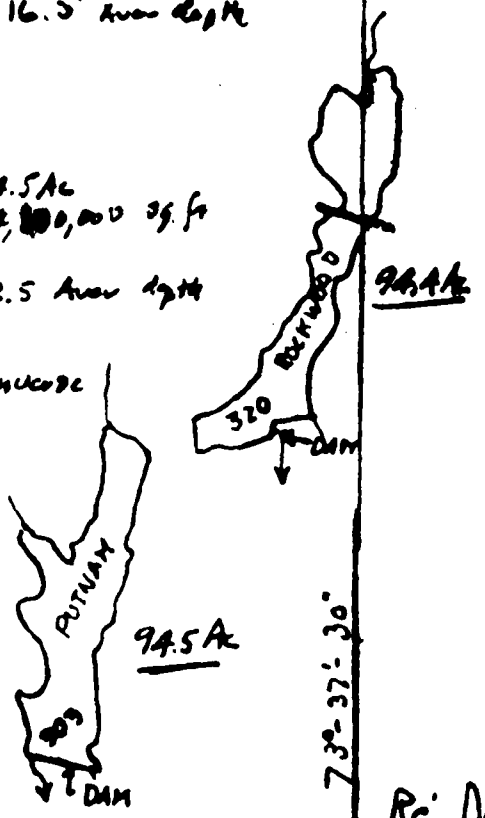
Converse 96.5 Ac

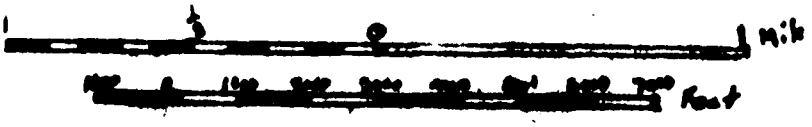
96.5 × 43,560 = 4,200,000 sq. ft

Say 10' Av depth

= 42,000,000 cu ft ÷ 7.48

= 315,000,000 m.g





NOTE: Get heights of FL above brook from Tom's topo maps for check

Re' Dam # 43

CONVERSE LAKE

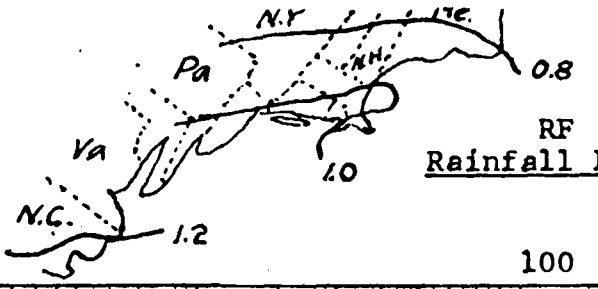
#3

Quad Auth Glenville

Scale 1:24,000

Feb 11 1966

J.W.C.



Static

RF
Rainfall Factor

1 - Sq.Mi.

1000 100 300 1000

Q_{design} = RF x LF x FF x Q

For Greenwich RF = 1.0
" Conn. " = 1.0 average

NOTE: This graph based on chart 1021.10 Bureau Public Roads
* - Additions by Cone
* LF factor should be based on estimated land use 50 years in the future

Peak Runoff Q in c.f.s.

$Q = 9A^{0.61}$

THIS GRAPH
FF Frequency - 1.0
RF Rainfall Factor - 1.0
LF Mixed Cover Steep - 1.0

Land Use and Slope Factors (LF)

Lots *	Land Slope	Steep over 2%	Flat 0.2%	Very flat no ponds
Small	100% Cultivated (row crops)	1.2	0.8	0.25
1-Acre	Mixed cover	1.0	0.6	0.2
4-Acre	Pasture	0.6	0.4	0.1
	Woods, deep forest litter	0.3	0.2	0.05

Frequency Factors (FF)

Frequency, years	5	10	25	50	100	200	400
Factor	0.6	0.8	1.0	1.2	1.4		
Conn. Formula *	0.5	0.7	1.0	1.4	1.8	2.6	3.6

"A"
25 YR
PEAK RUNOFF
Small Watersheds

Watershed in Acres

Peak Q in c.f.s.

LOGARITHMIC 359-120 KEUFFEL & ESSER CO.

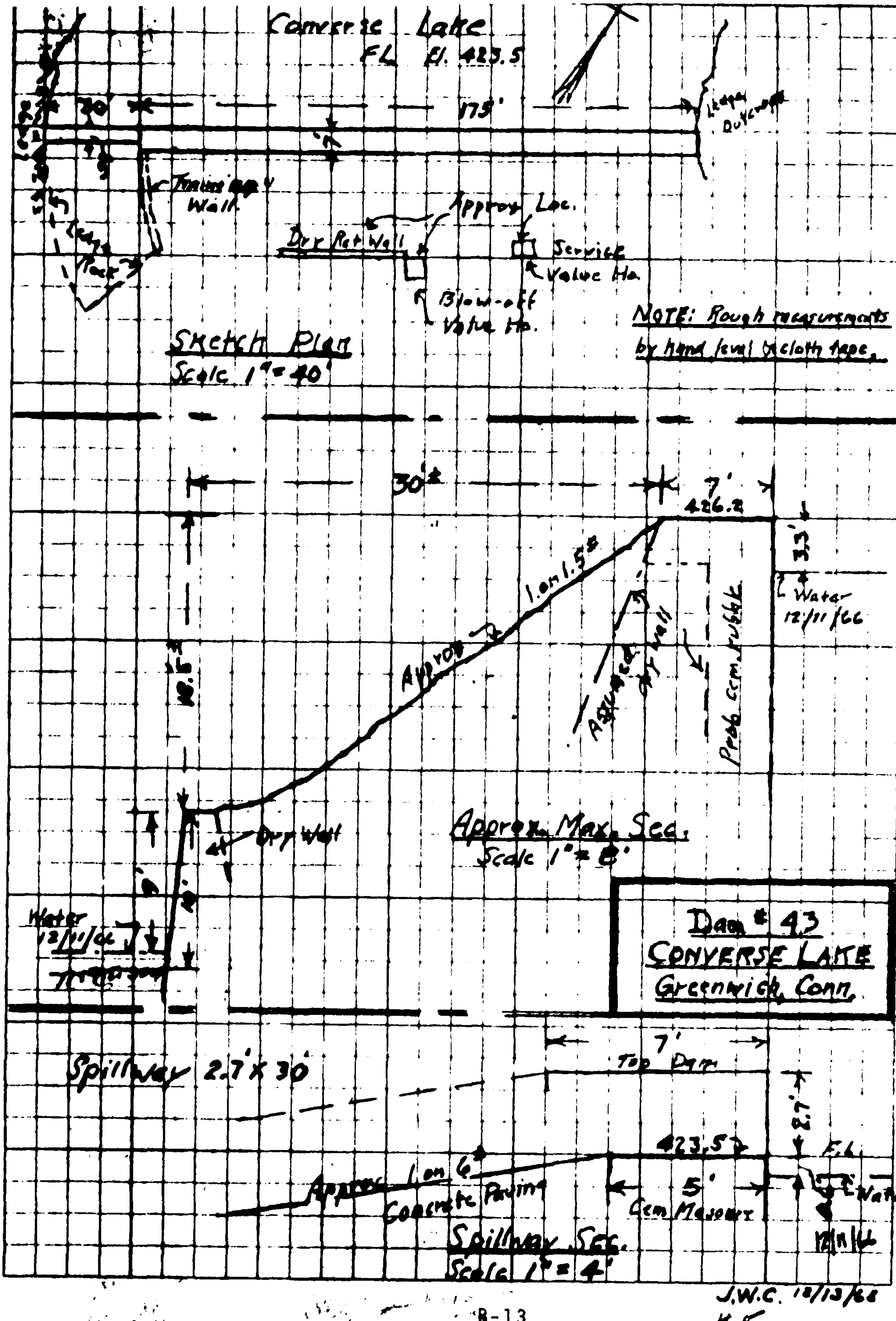
* Examples

100 Acres small lots. 0.5% slope, design 100 yrs.
R.F. L.F. F.F. Q
Q_{100} = 1.0 x 0.9 x 1.4 x 195 = 246 c.f.s.

500 Acres, woods & pasture, steep, design 100 yrs.
Q_{100} = 1.0 x 0.6 x 1.4 x 580 = 487 c.f.s.

J. W. Cone
Oct. 1963
Rev. Apr. 1965
Sheet 1 of 3

4


Converse Lake
F.L. El. 423.5
30'
175'
Ledge Outcrop
Training Wall
Ledge Rock
Approx. Loc.
Dry Ret Wall
Service Valve Ho.
Blow-off Valve Ho.
NOTE: Rough measurements by hand level & cloth tape.
Sketch Plan
Scale 1" = 40'
30'±
7'
426.2
3.3'
Water 12/11/66
1 on 1.5±
Approx
Assumed dry wall
Prob. cem. rubble
Dry Wall
Approx. Max. Sec.
Scale 1" = 8'
Water 12/11/66
Dam # 43
CONVERSE LAKE
Greenwich, Conn.
Spillway 2.7' X 30'
7'
Top Dam
2.7'
423.5
F.L.
Approx. 1 on 6
Concrete Paving
5'
Cem. Masonry
Water 12/11/66
Spillway Sec.
Scale 1" = 4'
J.W.C. 12/13/66
#5

v Cone

NEW YORK LICENSE 4755
CONNECTICUT REGISTRATION 4

JOSEPH W. CONE
CIVIL ENGINEER
124 HAVEMEYER PLACE
GREENWICH, CONNECTICUT
06830

TELEPHONE
TOWNSEND 9-2152

December 19, 1966

J. A. Kirby Co.
Civil Engineers
219 Westchester Avenue
Port Chester, N.Y.

Re: Dam #43 Converse Lake
Greenwich, Conn.

Dear Sir:

I am investigating the condition of the Converse Lake Dam for the Connecticut State Water Resources Commission. This dam is located on the East Branch of the Byram River, west of North Street and north of Upper Cross Road.

I came to Greenwich in 1905. The dam was then in existance. I believe it was built between 1900 and 1905, either for E. C. Converse or for a Mr. Smith. There seems to be evidence that not only the main dam but the two dikes west of the main dam were designed by some engineer. The contractor, I believe, was Frastos Burns.

Both the main dam and the dikes have a masonry wall on the waterside and backed up by earth fill on very steep slopes, now overgrown with large trees.

Whether or not the dam, and dikes, are safe depends in large measure on the massiveness of the masonry portion of the structures. This is the information I am seeking.

Will you please search your files to determine whether or not your firm designed the dam and dikes. If so, and you have the tracings, please let me know cost of four prints.

Enclosed print shows approximate location of the main dam and the two dikes.

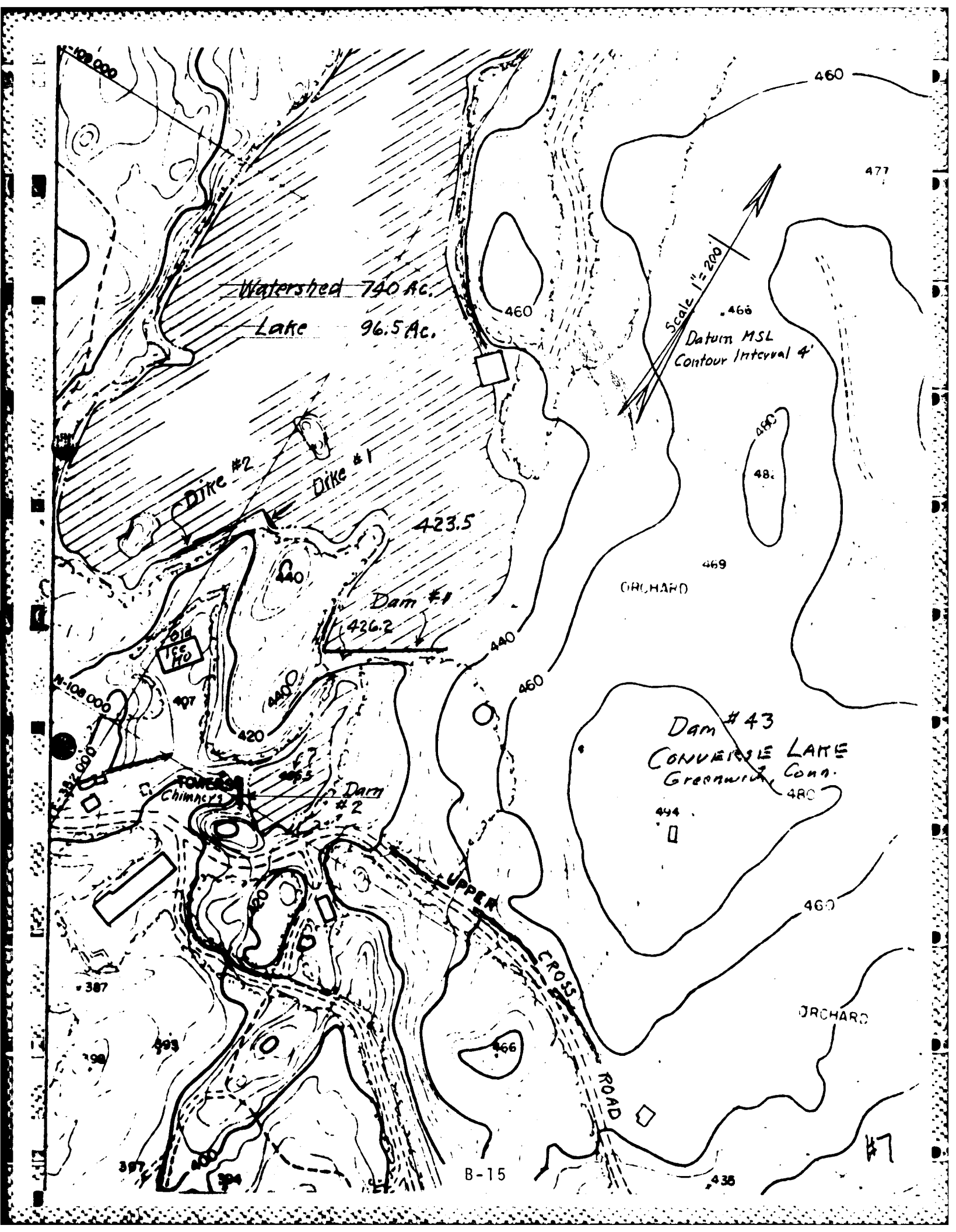
Yours very truly,

JWC/dr
Encl-1
cc: Water Resources Comm.

J. W. Cone

Ditto letter to S. E. Minor & Co
Greenwich, Conn.

#6


Watershed 740 Ac.
Lake 96.5 Ac.
Dike #2
Dike #1
423.5
Dam #1
436.2
Old Ice Ho
Dam #2
Powder Chimney
Dam #43
CONVERSE LAKE
Greenwich, Conn.
Scale 1" = 200'
Datum MSL
Contour Interval 4'
ORCHARD
ORCHARD
UPPER CROSS ROAD
460
440
420
480
477
469
494
387
466
435

December 30, 1966

Mr. Lewis S. Rosenstiel
Box 461
Greenwich, Connecticut

Dear Mr. Rosenstiel:

During the course of the recently completed program of inventorying all the dams in the state, several of the dams and dikes on your property in Greenwich were found to be in need of attention. The Water Resources Commission, according to the General Statutes of Connecticut (copy enclosed) has jurisdiction over all dams, " . . which by breaking away or otherwise, might endanger life or property . . ."

There is one dam and two dikes on Converse Lake north of Upper Cross Road, with which we are particularly concerned, and one dam immediately below the dam on Converse Lake. We have had an engineering firm which acts as a consultant to this Commission examine and report on these dams and dikes. A location sketch is enclosed explaining the references in the consultant's report which we quote:

" RECOMMENDATIONS"

1. That the owner immediately instruct his estate superintendent, Mr. Leonard, to <u>inspect the leaks</u> at the main dam (dam #1) at least twice weekly and to note whether or not:

   (a) Flow is increasing.
   (b) Sediment is carried by the flow.

   If either occurs to notify your Commission at once.

✓ 2. Immediately clear spillway-channel of all growth and debris.

3. Within one year remove all trees more than 3" diameter, breast high, from Dam #1 and Dikes #1 & #2. Advantageous to remove trees when ice is thick on lake.

4. Weatherproof top of present dam.

5. See to it that the present blow off and service valves are not frozen and are in working order.

6. Suggest to the owner that he employ a professional engineer particularly competent in estimating of flood flows and dam construction. One who is a PE in chemistry or electrical or industrial engineering, etc., not necessarily acceptable.

   The owner to protect his own interests, not onlyffor the scenic value to his property of Converse Lake but from substantial damage lawsuits, should the dam fail, should welcome this suggestion.

7. Said engineer should study and recommend as to the following:

   (a) Determine heights of Dikes #1 & #2 relative to Dam #1.

   (b) For future design whether to

      (1) Raise Dam #1 & Dikes #1 & #2 or
      (2) Widen present spillway or
      (3) Convert Dike #2 into an emergency relief spillway.

   (c) Advise lowering Dam #2 so that leaks at Dam #1 can be more definitely observed.

   (d) Safety of present dam.

There is one other dam which we believe to be on your property and which is in need of attention. This a masonry dam on the

Horseneck Brook approximately 800 feet west of the junction of North Street and North Stanwick Road. This dam has a few trees growing quite close to the dam which should be cut down to avoid possible storm damage.

We would like a letter from you stating your intentions as to carrying out these specific recommendations.

Very truly yours,

William P. Sander
Engineer - Geologist

WPS:WO:y

Enclosures

New York License
Connecticut Registration

JOSEPH W. CONE
CIVIL ENGINEER
124 HAVEMEYER PLACE
GREENWICH, CONNECTICUT
06830

TELEPHONE
TOWNSEND 9-2152

January 2, 1967

Mr. William P. Sander
Water Resources Commission
State Office Building
Hartford, Conn. 06115

Re: Dam #43 Converse Lake
Greenwich, Conn.

Dear Mr. Sander:

Enclosed are two prints of sections of Converse Dam furnished by S. E. Minor & Co., Civil Engineers. To date I have not heard from J. A. Kirby Co., another firm of engineers I thought might have information in their files. I believe we have hit "pay-dirt" by Plan "A" and Plan "B" is relevant.

Plan "A" is interesting since it agrees substantially with rough measurements taken Dec. 11, 1966 and with my surmise as to possible construction features. You will note by studying the sections that my guess "longitudinal cracks parallel to face of dam and signs of settlement" is explained by the probable settlement of "dry rubble" backing shown on "A".

It is not known who took the measurements, nor why they were made and plotted. There was no tracing, so I ordered one be made and prints furnished.

Plan "B" evidently was a tentative design by S. E. Minor and was calculated and drawn by Leon F. Peck; I recognize his printing and thoroughness. On this section I have plotted "A" in red, also in green top portion as measured Dec. 11, 1966.

If the dam was built as shown by "A", you will note that there is more than twice as much dry rubble masonry in the dam as would have been required for a much safer cement rubble structure, suggested by "B". And in addition there is the considerable volume of "earth and stones". All that was needed was cement mortar to obtain a better dam at less cost following design "B".

Knowing the several persons involved in this situation I believe I can reconstruct, though not prove, the sequence of events that actually happened.

1. S. E. Minor was retained to run a flow line to determine areas to be flooded, land to be acquired, if any, and areas to be cleared. Some engineers had to do this, otherwise they would not have known where to construct dikes #1 and #2 to prevent run-out.
2. S. E. Minor then designed a tentative maximum section of dam as shown on "B". Apparently his services were then terminated because there is no plan found that shows spillway, outlet conduits, or valve houses. Note that probable top of proposed dam was to be 7' above FL, width of spillway not known.

3. I believe the owner, and possibly the contractor, had but small regard for engineers and together they decided to construct the dam as shown on "A".

Referring to plane at X-X on section "B", you will note that there is a possible weakness particularly if the dam should be substantially over-topped and earth fill and dry rubble backing washed away. I have not attempted to make an analysis of this situation. This is mentioned to draw attention, that although spillway capacity, if cleared of debris, is sufficient for the present, it would not be when more intensive land use of the watershed occurs. This matter is noted in Item 7-b in my recommendation of Dec. 19, 1966.

The additional information relieves me somewhat as to the safety of the dam under present land use conditions; it does not influence me to revise the recommendations in my report of Dec. 19, 1966, particularly clearing spillway and removal of trees over 3" in diameter - it would be better to remove all trees from the dam and dikes. The 3" suggestion is a compromise.

Roots of large trees have undoubtedly penetrated deeply into dry rubble fill and possibly to some extent into cement rubble facing. It is not only possible but probable that during some future terrific windstorm some large trees will be uprooted, thereby dislodging dry rubble and weakening the structure. In my opinion the dam shown by "A" would have been a safe structure

if no earth fill had been placed or better if no trees had been allowed to grow on the fill.

May I suggest that your Commission request the Town to inform you of any future subdivision plans that would increase runoff so that the Commission could take appropriate action. Also instruct the owner to inform the Commission whenever the lake is drawn down to a considerable amount so that the cement rubble masonry facing can be inspected for signs of deterioration.

I trust your Commission will not criticize me for this perhaps too long disertation. I will not live forever and believe it portinent to have on the record what knowledge and observations I have concerning the situation; this in the interest of the Town of Greenwich as well as for your Commission.

Yours very truly,

J. W. Cone

JWC/dr
Enc: Sections "A" & "B"

S. E. MINOR & CO., INC.
CIVIL ENGINEERS
101 MASON STREET
GREENWICH, CONNECTICUT—06830

September 26, 1967

Mr. Lewis S. Rosenstiel,
Conyers Farm,
North Street,
Greenwich, Conn. 06830

Re: Dam

Dear Sir,

As requested by Mr. Leonard , we inspected the dam in Conyers Farm for the purpose of getting levels and making recommendations regarding stopping leaks.

Results of levels are as follows:-

Assumed elevation of spillway (29' wide)	100.0
Top of dam elevation	102.8
Top of earth dike	102.0

The leaks through the dam have practically stopped since large trees have been removed. We have recommended that a thin cement mortar grout be poured into all cracks along the top of the dam being careful not to let dirt get into the cracks when cleaning the surface.

The main leak at the base of the dam appears to be from a broken blow-off pipe. It would be necessary to drain the lake at time of low flow in order to inspect the pipe.

If this is done, we would suggest that a screen be placed over the intake end of the pipe to prevent fish from escaping and, when lake water is lowered to level required to prevent fish from dying, constructing a temporary sand bag dam around the end of the pipe. The pipe could then be completely exposed for proper inspection.

Should such an inspection reveal breaks in the pipe, repairs could be made by inserting a smaller pipe inside the present one and grouting the space between. The cost of this method would be only a fraction of that required to cut through the dam and replace an entirely new blow-off pipe.

Yours very truly,

S. E. MINOR & Co., Inc.

W.R.Devaul

W.R.Devaul

WRD:kh

c: Mr. J. Leonard

HEAGNEY, LENNON & NIGRO
ATTORNEYS AT LAW

JOHN G. HEAGNEY
FRANCIS X. LENNON, JR.
MARTIN L. NIGRO

248 GREENWICH AVENUE
GREENWICH, CONNECTICUT 06830

NORMANDY 1-8400

May 2, 1968

Water Resources Commission
State of Connecticut
State Office Building
Hartford, Connecticut 06115

Attention: Mr. William H. O'Brien, III

Re: Converse Lake Dam, Greenwich

Dear Mr. O'Brien:

We are enclosing herewith a report from S. E. Minor & Co. with respect to the Converse Lake Dam.

Mr. James Leonard, who is in charge of the property, has employed Mr. James Natale to do the grouting work referred to in the S. E. Minor letter and to inspect the blow-off pipe referred to in the same letter.

Since the letter of December 30, 1966, which originally brought the subject of the dam to our attention, the following work has been done:

1. The spillway-channel has been cleared of all growth and debris.

2. All trees more than three inches in diameter have been removed from Dam #1 and Dikes #1 and #2.

3. Trees close to the masonry dam on Horseneck Brook have been cut down.

4. An inspection and study has been made by S. E. Minor.

5. Mr. Natale has been employed; work to commence before summer.

It is our belief that all the above indicates that your recommendations have been implemented or are in the process of being implemented.

Please let me hear from you if the steps taken thus far do not meet with your approval.

Very truly yours,

HEAGNEY, LENNON & NIGRO

by: Frederick X. Lennon Jr.

FXL/ml
Enclosure

S. E. MINOR & CO., INC.
CIVIL ENGINEERS
161 MASON STREET
GREENWICH, CONNECTICUT 06830

July 15, 1968

Mr. Francis X.Lennon Jr.,
C/o Heagney, Lennon & Nigro,
248 Greenwich Avenue,
Greenwich, Conn. 06830

Re: Converse Lake Dam

Dear Sir,

I inspected the dam at Converse Lake again on July 12, 1968 to get data requested by the State Water Resources Commission letter to you dated May 16, 1968.

Conditions are the same as reported in my letter to Mr. Rosenstiel dated September 26, 1967.

Clear water is running out at the toe of the dam under the blow-off pipe between valve and dam in sufficient volume to fill a 3 foot wide brook down stream to a depth of about 3 inches. It is my belief that this is coming from a break in the blow-off pipe. This cannot be substantiated without draining the lake or excavating back into the dam along the line of the pipe.

I am told that a considerable flow existed down the gulley on the east side of the dam before the trees were cut. This has stopped entirely except for a dampness which appears on the opposite side of the gulley from the dam and at a higher level than the bottom of the gulley. This is apparently seepage from the hill east of the dam.

My recommendation to pour a thin cement grout into all cracks showing in the top of the masonry was for the purpose of filling voids caused by roots of trees forcing stones apart. These cracks show in only a small section near the down stream side and do not carry through to the upstream side.

In my opinion, the dam is perfectly safe. The leak only causes water level in lake to drop below the spillway level during summer months. It was about 1 inch below at the time of my inspection.

I have not tried the valve to see if it works. Workmen on the property could do this.

The State inquired about the dikes. There are two separated by a very small knoll. Both are 2 feet above spillway level and 0.8 feet below

top of dam.

Please let me know if I am to prepare plan and specifications for making repairs as required by the State.

Very truly yours,

S. E. MINOR & Co., Inc.

W. R. Devaul

WRD:kh

A. J. MACCHI • ENGINEERS

EXECUTIVE OFFICES • 44 GILLETT STREET • HARTFORD, CONN., 06105 • PHONE 525-6631

A. J. MACCHI
H. R. HOFFMAN
J. J. SCHMID

ASSOCIATE CONSULTANT
PROF. C. W. DUNHAM

September 18, 1968

Water Resources Commission
State of Connecticut
State Office Building
Hartford, Connecticut, 06115

Attention Mr. William H. O'Brien III

Re: Converse Lake Dam
Greenwich

Gentlemen:

On September 14, 1968, I, along with Mr. Girard of my office, inspected the conditions of the above-referenced dam, supplementary dikes and a small dam downstream of the main dam. The effluent water course crosses (in culvert) a moderately used country road a short distance from the site of both dams. Downstream from the road it is sparsely developed for about five miles.

The main dam is constructed of a heavy vertical face masonry wall in good condition, having a top width of about 8', a back slope of about 1.5:1 stopping at a toe wall about 8' high constructed of field stone, making a total downstream height of 25' $\pm$. The dam leaks at the toe a steady stream of about 1/2 CFS $\pm$ which appears to be coming from the direction of the valve house. The gurgling sounds one hears indicates the water has a clear channel from point of origin. It appears highly probable that one of the pipe joints in the drawdown has pulled apart (bell and spigot C.I.) or fractured as a result of frost or slide. This dam is covered with thick bushes about 4' $\pm$ high and it is not possible to make a good inspection of the slope, but, some horizontal cracks have developed in the berm due to sliding of the slope which appears to be too steep for stability. Also, the toe wall of field stone has shifted slightly out of plumb.

To analysis the leak, it is recommended that a plate be placed and secured over the two intake pipes and the valves opened to see if this leaking stops. If it stops, obviously, it is due to a defective joint or cracked pipe. Repairs may be accomplished from the downstream end and must be done because a broken line in the dam could result in critical failure. If the leak persists after the intake

pipes are closed and the valves opened, then the leak is in the dam itself either following the piping or through some developed channeling. This type of a leak is not as critical as a pipe failure in this type of dam, however, the cause should be found and the leak reduced. If this leak can be eliminated or greatly reduced, this dam appears to be structurally safe at present. To assure future conditions, improvements could be realized if some back-up stones are placed behind the toe wall on a flat slope which would also stabilize the back slope of the dam. Growth on the back slope should be periodically cut back to low bushes so that large roots would not develop and displace stones.

The dikes constructed along other parts of the shore line are of low head and do not appear to be critical. However, all large trees in the dike section over 3" in diameter should be removed as an overturned tree with a large root system could easily cause a local failure.

The lower dam below the main dam retains about a one acre shallow pond. This dam is a vertical wall constructed of loose field stones, some of which have been washed off. The crest of this dam is all spillway and a large flow of water could easily wash out part of this dam. If this dam at present serves no purpose, it should be removed, otherwise some stabilization of the top stones will be required.

Because of the small watershed of 730 acres and large spillway capacity of 28' x 2'- 6''high, the hydrology is not a critical factor.

Very truly yours,

A. J. MACCHI, ENGINEERS

A. J. MACCHI

cc.

October 2, 1968

Mr. Francis X. Lennon, Jr.
c/o Heagney, Lennon & Nigro
Attorneys at Law
248 Greenwich Avenue
Greenwich, Connecticut 06830

Subj: Converse Lake Dam
Greenwich

Dear Mr. Lennon:

As mentioned in our letter of August 26, 1968, we have had an inspection made of the subject dam by one of our consultants and we enclose a copy of his report.

We therefore request that the following action be taken:

1. Remove thick bushes about 4' high on the downstream slope to allow inspection thereof.

2. Remove all trees greater than 3 inches in diameter (preferably all trees) from the dikes on the lake.

3. Determine if leak is through the dam itself or from a defective joint or cracked pipe. The method suggested by our consultant is recommended as a practical method. We wish to be informed as to when this work will be done so that we and our consultant may be present. Once the nature of this leak is determined, plans should be prepared by an engineer registered in the State of Connecticut for the repair of the leaks and submitted to this Commission for approval.

4. To assure future conditions, after the nature and method of repair have been determined, back up stones should be placed behind the toe wall on a flat slope which will stabilize the back slope of the dam and prevent further shifting of the toe wall which has shifted slightly out of plumb.

5. The dam immediately below the Converse Lake Dam should be removed or the top stones stabilized. Items 4 and 5 should also be included in submitted plans.

The repairs to this dam should not necessarily be limited to these items but should include any other items noted by your engineers. May we hear from you at your earliest convenience?

Very truly yours,

William H. O'Brien III
Civil Engineer

WHOIII:vhb

cc: Lewis S. Rosentiel
Greenwich

cc: A. J. Macchi
Hartford

HEAGNEY & LENNON
ATTORNEYS AT LAW

JOHN G. HEAGNEY
FRANCIS X. LENNON, JR.

248 GREENWICH AVENUE
GREENWICH, CONNECTICUT 06830

(203) 661-8400

January 17, 1969

William H. O'Brien, III
State of Connecticut
Water Resources Commission
State Office Building
Hartford, Connecticut 06115

Re: Converse Lake Dam

Dear Mr. O'Brien:

We enclose herewith a report of divers inspection by Undersea Systems, Inc. for your file. Please consider the recommendations made by them and advise us if the procedures outlined would satisfy your commission. If so, we shall proceed to implement Phase II of the report.

Very truly yours,

HEAGNEY & LENNON

By: Francis X. Lennon

FXL:st

Enclosure

REPORT OF DIVER INSPECTION, CONYERS FARM DAM
GREENWICH, CONNECTICUT
December 29, 1968 (Phase I)

GENERAL

On December 29, divers from Undersea Systems, Inc. performed an underwater inspection of the water side of the Conyers Farm Dam in order to obtain necessary basic information to locate and correct a leak in this structure. The inspection was conducted under 6 to 10 inches of ice in water of 33 degrees temperature. The inspection revealed the size, location, and configuration of the two runoff pipes which penetrate the dam. In addition, a visual inspection of the stone face of the dam by the divers revealed no apparent evidence of major structural defects in the masonry of the structure. This report presents the results of the inspection, some deductions as to the piping configuration buried under the downstream side, and recommendations for a Phase II effort to locate the source of the leak.

RESULTS OF UNDERWATER INSPECTION

Divers located the position of the runoff pipes which are arrayed vertically, one above the other at a point on the dam approximately below a chain mounted in the stonework on the top surface. The lower pipe is approximately 21 inches inside diameter and extends outward from the vertical face of the dam by 40 inches. The pipe is not perfectly normal to the dam surface but has a slight skew in the plan view. (See sketches). The mouth of this pipe was covered with a screen which the diver cut away in order to clean the inlet mouth and determine the condition, which was good except for some scaling. This pipe is of cast iron or steel construction.

The second, smaller runoff pipe is located about four feet above the main pipe. The pipe coming out of the dam face is 50 inches circumference as measured (16" O. D.). This pipe extends about 40 inches from the vertical face and terminates in a 90^0 elbow measuring 37" circumference (11.77" O. D.). From this elbow there extends a short piece of vertical pipe measuring 36" circumference (11.45" O.D.) and 8" I. D.

This brings the mouth of the secondary runoff line approximately the same depth and position as the primary opening. The elbow on the secondary line is loose and the vertical pipe can be swiveled somewhat about a horizontal axis. The elbow may have a swivel joint, and this conjecture is supported by the observation that at one time the chain at the top of the dam was connected to the vertical section of pipe, perhaps to allow swiveling of the pipe and consequent adjustment of its inlet depth. This pipe inlet was also covered with a screen which the divers removed.

Underwater photographs were obtained of the runoff pipes and are included as a part of this report. Because of silting, these photographs are not as clear as would be desired. It is our intention to obtain further pictures in a Phase II effort.

CONFIGURATION OF RUNOFF PIPING

The location and correction of the leaks will require an understanding of the runoff piping arrangement. In addition to the diving work, Undersea Systems inspected the two valve houses and attempted to deduce from the visible piping the probable underground arrangement and philosophy of operation of the runoff system. The enclosed sketches present our conclusions as to the complete layout.

According to previous information, the larger pipe was originally connected to the Greenwich City water system. This pipeline was removed and the present line terminates just outside the upper valve house. If the gate valve were opened, the lake would drain down ~~the hill~~ to the level of this opening. The consequences of this are questionable and it appears that this line serves no present purpose.

The current scheme for controlling runoff and lake level appears to be the secondary 16 inch (nominal) line. There is a valve in this line in the upper valve house. The line is insulated inside the house and a slow leak is present somewhere under the insulation. This line takes a 90^0 turn inside the house and then drops vertically through the floor and probably goes directly to the lower valve house, from which the flow is directed into the lower pond which is connected in some way to the city water supply.

LOCATING THE LEAK

The leak has several possible sources. Water is flowing out of the footwall near the lower valve house. Its source can be:

POSSIBILITY A — A leak in one of the runoff pipes inside the dam. This would be determined if the leak stopped with one of the pipe inlets blocked.

POSSIBILITY B — A leak around the runoff pipes where they penetrate the upstream dam face. This source might be indicated by releasing tracer dyes near the penetrations with the pipes sealed off. The dye would show up at the leak discharge. A diver could probably see the dye enter the fissure underwater if visibility were good. (It is good until divers stir up the bottom silt).

POSSIBILITY C — A leak in the dam structure. We feel this is unlikely since the dam appears to be structurally sound and is well banked with earth. Locating this type of leak would require detailed leak tests at all possible suspect locations on the upstream side or excavation and dismantling part of the earth stone structure on the downstream side to backtrace the flow from the leak emergence.

RECOMMENDATIONS FOR PHASE II WORK

Review of the known facts points strongly to the likelihood of Possibilities A or B. The reasons are (1) location of the leak emergence close to the valvehouse, indicating a likely water path along or around the runoff pipes. (2) The apparent good condition of the masonry and earthwork as revealed by visual inspection.

We recommend the following work be accomplished in a Phase II effort:

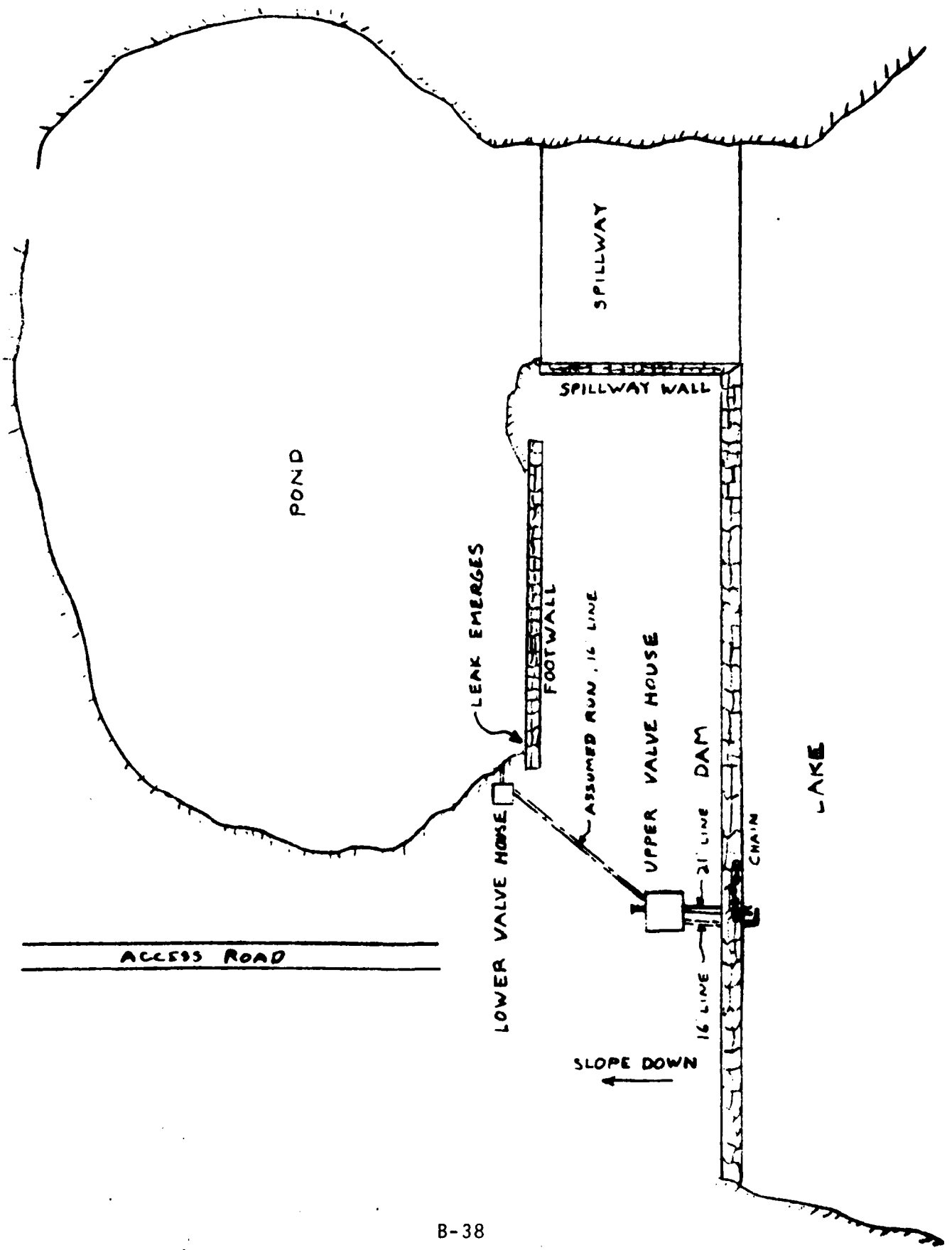
1. Divers clean silt and scale from both runoff pipes at upstream end. Seal each pipe in turn to see if leak stops.
2. If this does not stop leak, conduct dye test around each pipe penetration to see if leak is running down pipes. If this is the source of leak, we may be able to correct it on the spot using one of several types of underwater sealing compounds which chemically harden to a permanent seal.
3. Fabricate and install new inlet screens on both runoff pipes. The previous screens had to be cut away.

If the leak is from within the 16" runoff pipe, which would be determined by the closure tests, it may be necessary to excavate and replace piping. We might be able to make a simple repair by sleeving this pipe if a reduced diameter were permissible. However if the leak were in the primary line, we might be able to effect a permanent upstream closure of this pipe if it can be determined that this line is of no further use. In this case, we would not replace the inlet screen.

BY. [illegible] DATE 1/2/69 SUBJECT CONYERS FARM DAM SHEET NO. 1 OF 2.

CHKD. BY..... DATE ..... APPROXIMATE PLAN JOB NO.....

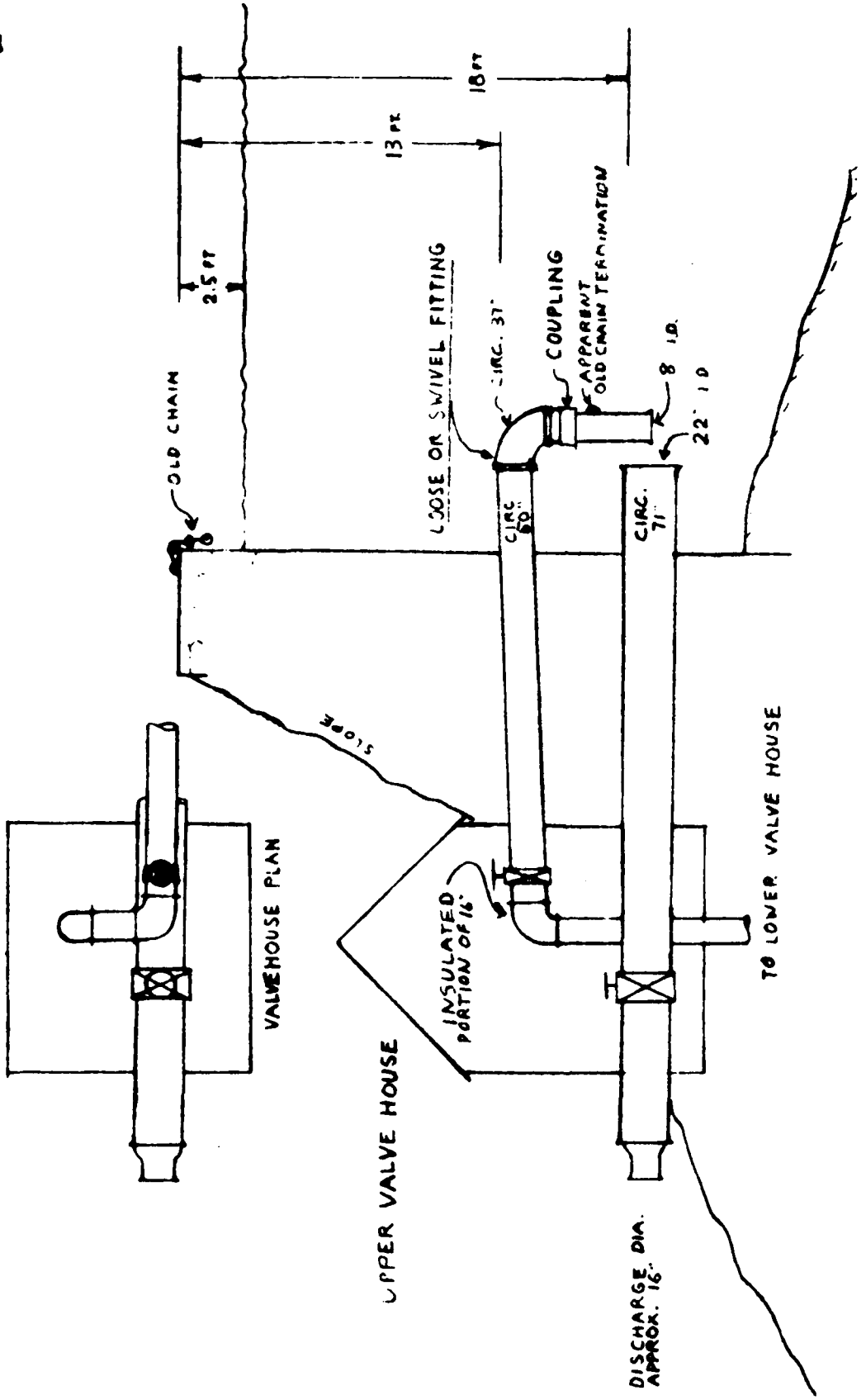
NO SCALE



BY GSA DATE 12/69 SUBJECT CONYERS FARM DAM SHEET NO. 2 OF 2

CHKD. BY DATE APPROXIMATE ELEVATION JOB NO.

NO SCALE



MACCHI & HOFFMAN • ENGINEERS

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A. J. MACCHI
H. R. HOFFMAN
J. J. SCHMID

ASSOCIATE CONSULTANT
PROF. C. W. DUNHAM

May 19, 1969

State of Connecticut
Water Resources Commission
165 Capitol Avenue
Hartford, Connecticut

Re: Converse Lake Dam
Greenwich, Connecticut

Gentlemen:

Attended meeting at site of dam on Friday, May 16, 1969. Present at this meeting were the following:

James B. Leonard - Caretaker of Property
G. Gordon Sammis, President - Undersea Systems Inc.
112 W. Main Street
Bayshore, New York
Bob Shourot, Vice President - Undersea Systems Inc.
Two Skin Divers
Wm. O'Brien III - Water Resources Commission
A. J. Macchi - Consulting Engineer

The Undersea Systems Inc. were engaged by the owner to implement Phase II of investigation as originally outlined which was to determine the source of leak through the dam. I was told that the following procedure was used:

A plywood panel with sponge rubber seal was placed over the outlet piping and the pipe stub was flooded with dye. This had no effect on the amount of leaking and dye did not show up in leaking water. This indicates that piping is intact eliminating piping as a leak source.

The reservoir face of the dam was then checked for leaks by inserting dye in the masonry joints. In this manner many leaky joints were discovered. These locations were marked with telltale tags.

This procedure was repeated in our presence. Using different color dye it was apparent that leaks had developed along two systems both originating from a separate group of joints. However, after a while, the dyes mixed indicating that the two systems were interconnected, but, one system leaked faster than the other.

State of Connecticut
Water Resources Commission
Hartford, Connecticut

May 19, 1969

These leaks through the masonry section of the dam at present are not critical, but, if allowed to get progressively worse, could combined with frost, eventually dislodge stones in the toe. It is recommended that these leaks be reduced as much as possible. Also, the top of the dam should be capped to prevent further movement in thaw-freeze cycles.

As was suggested by Mr. Sammis it is possible to caulk the leaky joints on the reservoir side with lead wool and effectively reduce the leaks. As an afterthought it may also be possible to pump in a non-shrink mortar such as "Embeco" using proper grouting equipment.

To cap off the top of the dam, the surface should be cleaned of growth, debris and loose mortar and then a 4" concrete slab can be placed, pitching the top 2" to shed water into the reservoir. This slab should be placed the full width of the dam in sections not over 20' long between construction joints. This will prevent shrinkage cracking. At the construction joint a strip of light gage (10 oz) copper, 12" wide should be used, cupping up the edges 3/4" so that water coming through the joint will shed out.

The concrete should contain an air entraining agent to better resist freezing and thawing cycles. Most concrete companies have this on hand. Also, be sure concrete is properly cured either by using a heavy duty curing agent or Sisalkraft paper.

Very truly yours,

MACCHI & HOFFMAN, ENGINEERS

A. J. MACCHI

cc.

April 30, 1970

Mr. Francis X. Lennon, Esq.
Heagney and Lennon
Attorneys at Law
248 Greenwich Avenue
Greenwich, Connecticut

Re: Converse Lake Dam
Greenwich

Dear Mr. Lennon:

Thank you for your letter of April 10, 1970 on the subject dam. We understand from your letter that the following work has been done: Leaks have been packed with lead wool, thin cement-mortar grout has been poured into the cracks, and a concrete cap has been placed over the masonry wall.

The last report from Under Sea Systems, Inc., in our file, is date January, 1969. The actual corrective work done to the dam was done in May, 1969 after which there was to have been a report submitted to this Commission by Under Sea Systems, Inc. describing the methods used, conditions found, actions taken, and results obtained. We would like a copy of this report for our files.

There is no comment in your letter in regard to the second paragraph of page two, our letter of May 23, 1969. May we hear from you at your earliest convenience.

Very truly yours,

William H. O'Brien III
Civil Engineer

WHOIII/leh

MACCHI & HOFFMAN • ENGINEERS

EXECUTIVE OFFICES • 44 GILLETT STREET • HARTFORD, CONN., 06105 • PHONE (203) 525-6631

A. J. MACCHI, P.E.
H. R. HOFFMAN, P.E.
MICHAEL GIRARD

ASSOCIATE CONSULTANT
PROF. C. W. DUNHAM

June 4, 1971

Water Resources Commission
State of Connecticut
165 Capitol Avenue
Hartford, Connecticut

Attention Mr. William H. O'Brien III

Re: Converse Lake Dam
Greenwich, Conn.

Gentlemen:

I reviewed the files and inspected the above-referenced dam on Thursday, June 3, 1971. Checked in particular, the leakage near the valve house.

The owner has done an excellent job of capping the top of the dam with a concrete slab and has succeeded in reducing leakage through the dam to a negligable amount.

This dam is in good condition and will remain so for a long time.

Very truly yours,

MACCHI & HOFFMAN, ENGINEERS

A. J. MACCHI

INTERDEPARTMENT MESSAGE

STO-201 12-69

SAVE TIME: *Handwritten messages are acceptable. Use carbon if you really need a copy. If typewritten, ignore faint lines.*

TO	File	AGENCY Water & Related Resources	DATE April 11, 1972
FROM	Victor F. Galgowski Supt. of Dam Maintenance	AGENCY Water & Related Resources	TELEPHONE
SUBJECT	Converse Lake Dam, Greenwich 7 BY5.4E0.9C4.9		

The undersigned inspected this site on April 7, 1972. Approximately one inch of water was flowing through the spillway. Slight seepage was noted at the southern end of the earthen dam. A slight flow of water still continues to flow through the rock wall at the toe of the dam.

The repairs completed by the owner appear to place the structure in a safe condition. A letter will be sent to the owner suggesting that the brush and small trees that have started growing on the downstream side of the dam be removed.

Victor F. Galgowski
Supt. of Dam Maintenance

VFG:ljg

SAVE TIME: *If convenient, handwrite reply to sender on this same sheet.*

No. 41-1

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Long 73-38-55
Lat 41-07-35

Inventoried By

Date 2/9/66

Name of Dam or Pond Converse Lake

Code No. BY5.9E0.9C9.9

Nearest Street Location Upper Cross Rd

Town Greenwich

U.S.G.S. Quad. Mount Kisco, N.Y.-Conn.

Name of Stream Converse Pond Brook

Owner Lewis S. Rosenstiel et al (as trustee)

Address Box 461
Greenwich, Conn.

1900

Pond Used For DA 1.095 sq mi

Dimensions of Pond: Width _____ Length _____ Area 115 ac

Total Length of Dam 150'± Length of Spillway 20' 54 ft in flare 5' wide

Location of Spillway West end of dam

Height of Pond Above Stream Bed 20 ft

Height of Embankment Above Spillway 3 ft. spillway

Type of Spillway Construction masonry wall + earth - trees growing in spillway

Type of Dike Construction masonry wall - earth downstream

Downstream Conditions Small pond and dam (see #40) + Upper Cross Rd

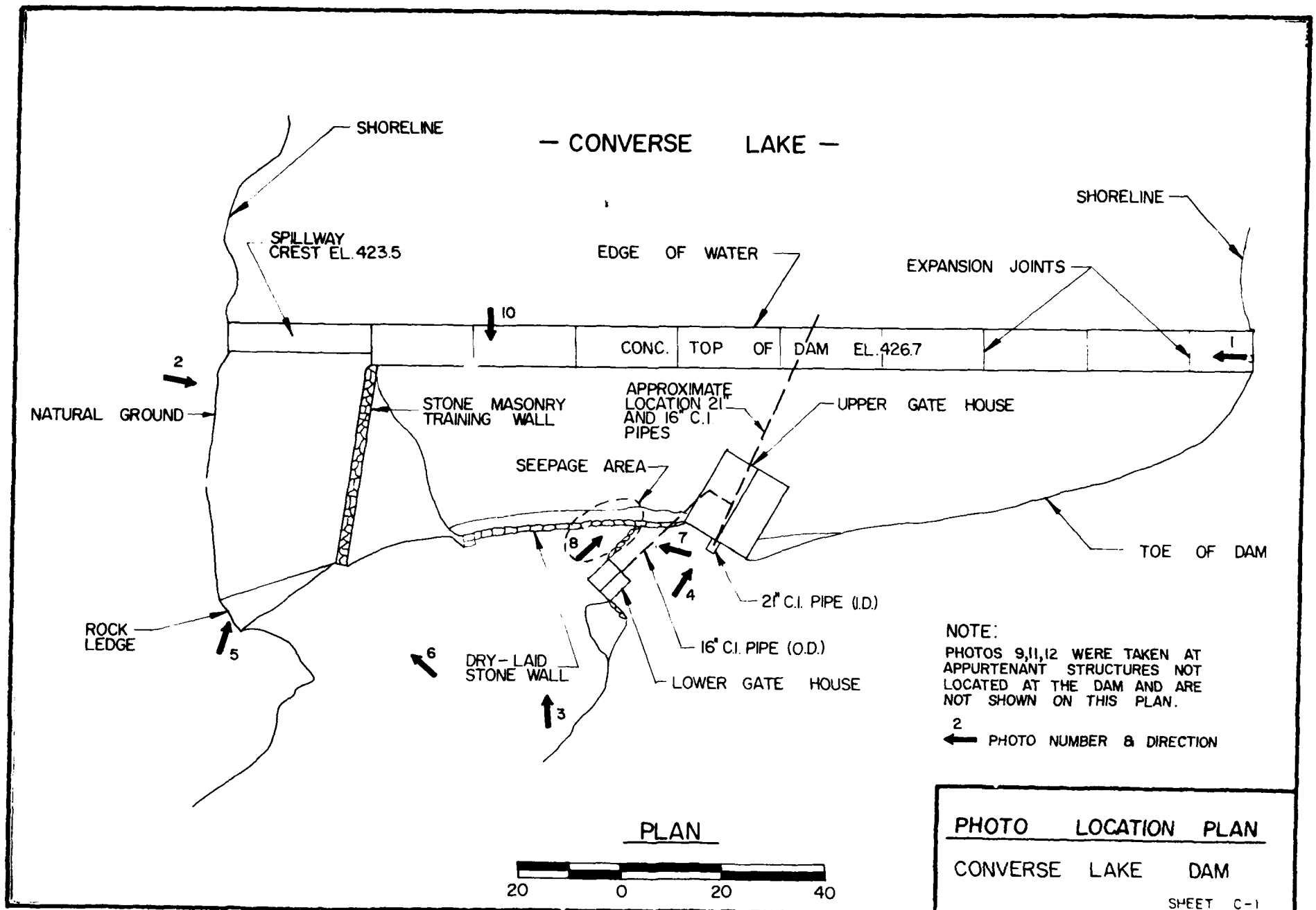
Summary of File Data letter sent to Macchi - 2/15/66

Remarks level of lake about one foot below spillway. Well built, block masonry but many large trees on downstream slope and at top of dam. Small flow of water at base of dam apparently flowing thru dam - no flow over spillway

Would Failure Cause Damage? Yes Class B

APPENDIX C

DETAIL PHOTOGRAPHS


— CONVERSE LAKE —
SHORELINE
SPILLWAY CREST EL. 423.5
EDGE OF WATER
SHORELINE
EXPANSION JOINTS
CONC. TOP OF DAM EL. 426.7
NATURAL GROUND
STONE MASONRY TRAINING WALL
APPROXIMATE LOCATION 21" AND 16" C.I PIPES
UPPER GATE HOUSE
SEEPAGE AREA
TOE OF DAM
21" C.I. PIPE (I.D.)
16" C.I. PIPE (O.D.)
ROCK LEDGE
DRY-LAID STONE WALL
LOWER GATE HOUSE
1
2
3
4
5
6
7
8
10
NOTE:
PHOTOS 9,11,12 WERE TAKEN AT APPURTENANT STRUCTURES NOT LOCATED AT THE DAM AND ARE NOT SHOWN ON THIS PLAN.
2 PHOTO NUMBER & DIRECTION
PLAN
20 0 20 40
PHOTO LOCATION PLAN
CONVERSE LAKE DAM
SHEET C-1

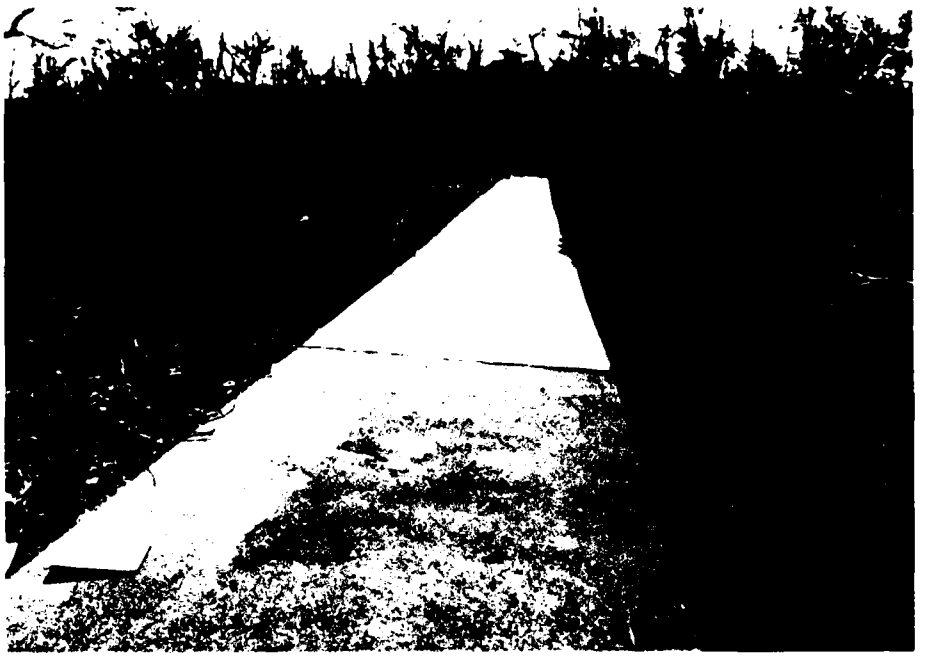


Photo I - Crest of dam from left abutment (Nov. 1979).

Photo 2 - Downstream slope and crest of dam from right side of spillway (Jan. 1980).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Converse Lake Dam Converse Pond Brook Greenwich, Connecticut
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE# 27660 KE DATE Feb. 1980 PAGE C-1

Photo 3 - Downstream slope of dam, dry-laid retaining wall and lower gate house (Jan. 1980).

Photo 4 - Upper gate house. Note clogged condition of 21 inch outlet pipe (Nov. 1979).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Converse Lake Dam Converse Pond Brook Greenwich, Connecticut
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE# 27660 KE DATE Feb. 1980 PAGE C-2

AD-A142 699 NATIONAL DAM INSPECTION PROGRAM CONVERSE LAKE DAM (CT 00044) CONNECTICUT.. (U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 2/2

UNCLASSIFIED F/G 13/13 NL

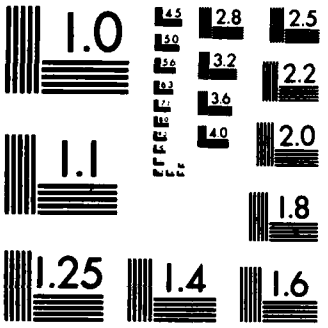


Photo 5 - Spillway and left spillway training wall (Nov. 1979).

Photo 6 - Spillway and discharge channels from downstream (Jan. 1980).

Photo 7 - Dry-laid stone retaining wall at downstream toe of dam (Nov. 1979).

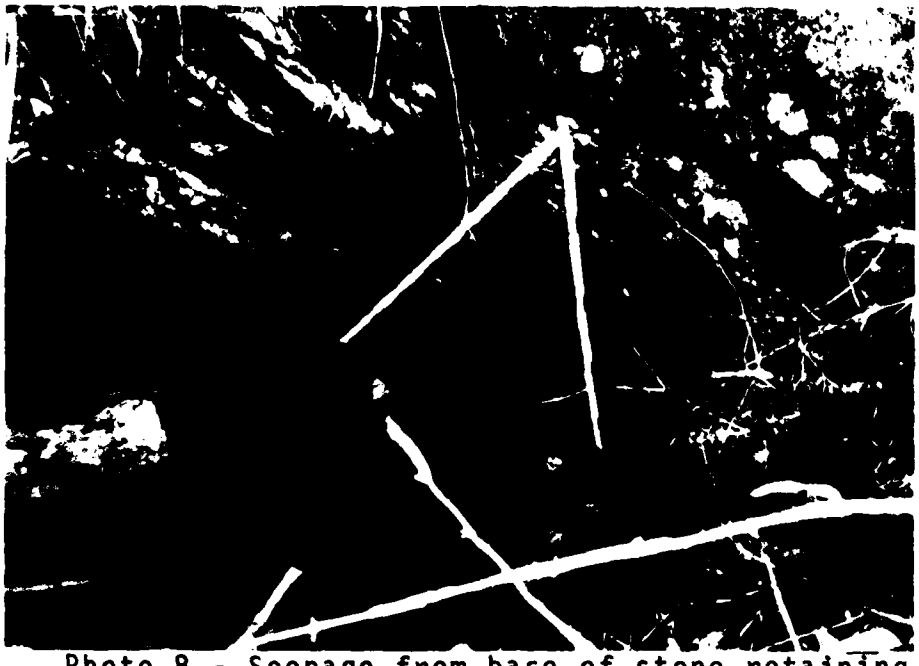


Photo 8 - Seepage from base of stone retaining wall at right side of lower gate house (Nov. 1979).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Converse Lake Dam Converse Pond Brook Greenwich, Connecticut CE# 27 660 KE
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	DATE 2/80 PAGE C-4

Photo 9 - Downstream face of old mill dam downstream from Converse Lake Dam (Jan. 1980).

Photo 10 - Discharge channel and pond from old mill dam looking downstream from top of Converse Lake Dam (Jan. 1980).

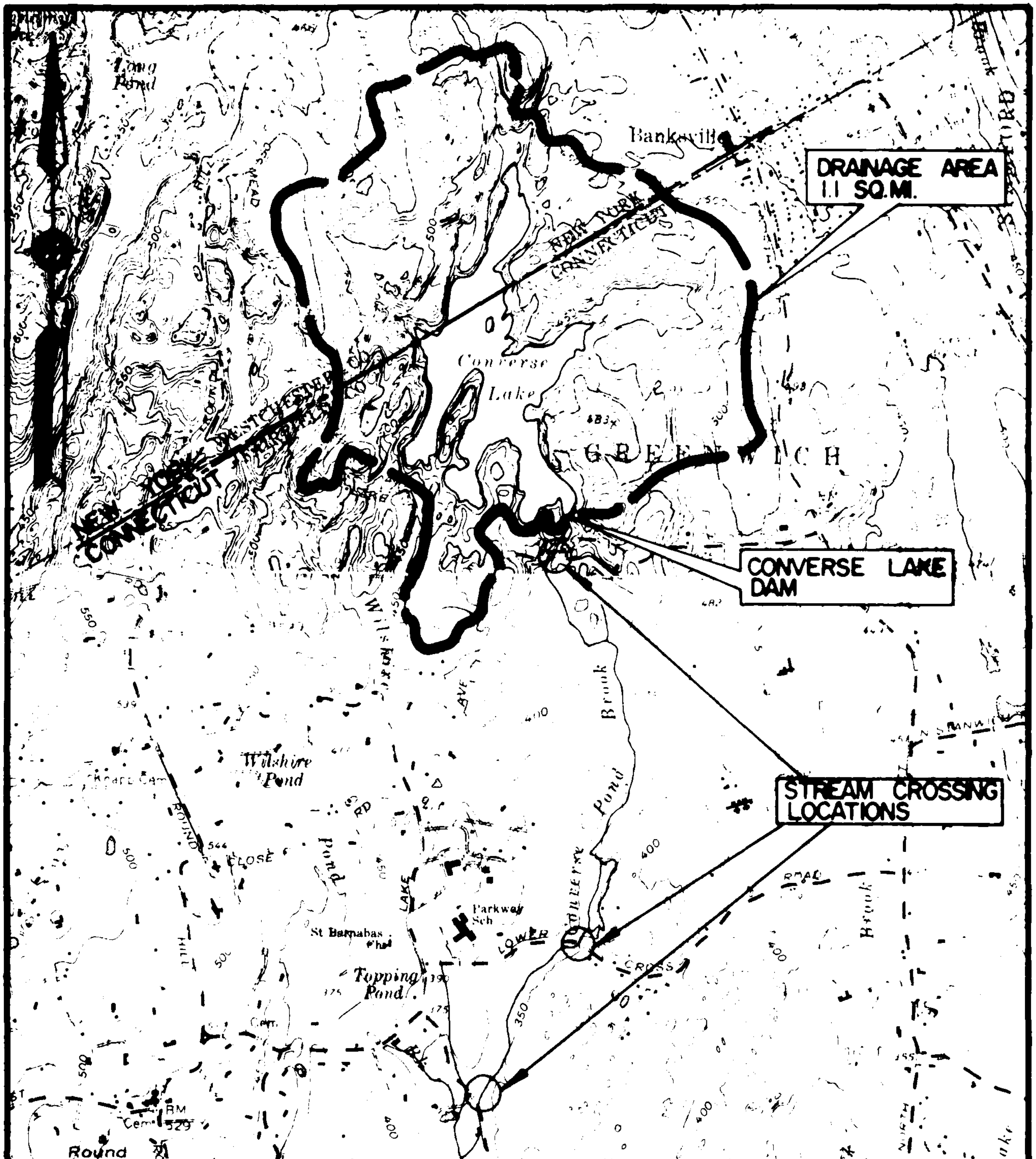
US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Converse Lake Dam Converse Pond Brook Greenwich, Connecticut
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE# 27660 KE DATE Feb. 1980 PAGE C-5

Photo 11 - Crest of easterly dike from left abutment (Jan. 1980).

Photo 12 - Dry-laid stone retaining wall and toe of westerly dike (Jan. 1980).

APPENDIX D

HYDRAULIC/HYDROLOGIC COMPUTATIONS


DRAINAGE AREA
1.1 SQ.MI.
CONVERSE LAKE
DAM
STREAM CROSSING
LOCATIONS
USGS QUADRANGLES
MOUNT KISCO 1971
GLENVILLE 1971
Bankville
Converse
Lake
GREENWICH
NEW YORK
CONNECTICUT
Wilshire
Pond
Topping
Pond
Parkway
Sch
St Barnabas
Round
Hill
Brook
CAHN ENGINEERS INC
WALLINGFORD CONNECTICUT
ENGINEER
U S ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
DRAINAGE AREA MAP
CONVERSE LAKE DAM
CONVERSE POND BROOK GREENWICH CONNECTICUT
DWN BY
CKD BY
APP BY
SCALE 1"=2000'
DATE FEBRUARY 1980
SHEET D-1

Cahn Engineers Inc. — Consulting Engineers

Project NON FEDERAL DAMS INSPECTION — Sheet D-1 of 13
Computed By R.F. JAHN — Checked By [illegible] — Date 11/[illegible]
Field Book Ref — Other Refs. CL #27 660 HE — Revisions

HYDRAULIC / HYDROLOGIC INSPECTION

CONVERSE LAKE DAM, GREENWICH CONN.

1) PERFORMANCE AT PEAK FLOOD CONDITIONS

1. PROBABLE MAXIMUM FLOOD

a) WATERSHED AREA CLASSIFIED AS "ROLLING"

b) WATERSHED AREA : DA ≈ 1.09 Sq. Mi.

NOTE : FROM CONN. DEP. BULLETIN No 1, 1972, (GAZETTEER OF NATURAL DRAINAGE AREAS) PG. 72

c. PEAK FLOOD (FROM NED ACE GUIDELINES - GUIDE CURVES FOR PMF)

i) PMF ≈ 23[illegible] CFS/SQ.MI × 1.09 SQ.MI = 2500 CFS

ii) 1/2 PMF ≈ 1250 CFS

2) SURCHARGE AT PEAK INFLOW (PMF & 1/2 PMF)

a) LAKE OUTFLOW RATING CURVE

i) SPILLWAY

THE CONVERSE LAKE DAM SPILLWAY IS A BROAD CRESTED TYPE SPILLWAY, (±)30' LONG AND WITH ELEVATION OF (±)423.5' MSL, AND IS LOCATED ON THE RIGHT SIDE OF THE DAM. THE HEIGHT BELOW THE SPILLWAY CREST AND THE TOP OF THE DAM IS (±)3.2'. THE TERRAIN TO THE RIGHT OF THE SPILLWAY RISES ALMOST VERTICALLY FOR ABOUT 10.'

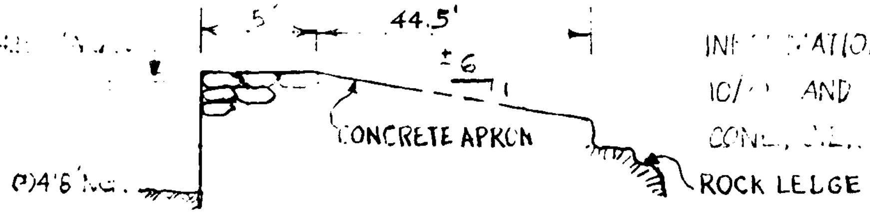
SEE DIAGRAM PG D-2.

Cahn Engineers Inc. Consulting Engineers

Project NON FEDERAL DAMS INSP[illegible] Sheet [illegible] of [illegible]
Computed By [illegible] Checked By [illegible] Date [illegible]
Field Book Ref. Other Refs. [illegible] 660 HB Revisions

[illegible] LAKE DAM

[illegible] AT PEAK INFLOWS



INF[illegible]ATION FROM [illegible] FIELD [illegible] 10/[illegible] AND DRWS [illegible] CONC, [illegible]

ASS[illegible] C [illegible] 3.0 FOR SPILLWAY [illegible]

[illegible] SPILLWAY DISCHARGE IS APPROXIMATED BY $Q = [illegible]$

[illegible] CURVE FOR [illegible] OVERTOPPING THE DAM AND DIKES

DAM

THE [illegible] LAKE DAM IS A STONE MASONRY AN[illegible] (±) 175' LONG WITH A TOP ELEVATION OF (±) 426.7 N[illegible]. THE [illegible] FACE [illegible] VERTICAL AND THE D/S FACE IS (±) 1.5^H TO 1^V. THE [illegible] TO THE [illegible] ^{H} TO 1^V. SEE DAM, SPILLWAY & DIKE SECTIONS [illegible].

DIKES

THERE [illegible] THREE GROUPS (A,B,C) OF DIKES TO THE [illegible] OF THE DAM [illegible] TOTALING (±) 61[illegible] IN LENGTH. GROUPS A & C (TOTALING [illegible] IN LENGTH) HAVE A TOP ELEVATION OF (±)425.[illegible] AND GROUP B, (±) 1[illegible] LONG, HAS A TOP ELEVATION OF (±) 42[illegible]. EXCEPT FOR THE TWO DIKES OF GROUP C ([illegible] LONG, 1[illegible] HIGH AND (±) 1[illegible] LONG, 15' HIGH) ALL ARE TYPICALLY LESS THAN 4 [illegible] HEIGHT.
ADJACENT TERRAIN TO THE DIKES VARIES IN [illegible] AND ELEVATION AS SHOWN ON THE DAM, SPILLWAY & DIKE SECTIONS ON PG [illegible].

CONVENT LAKE DAM

2 CONT'D OUTFLOW RATING CURVE

ASSUME C = 2.0 FOR FLOWS OVER DIKES & ALL NATURAL ADJ. TERRAIN

C = 2.7 FOR FLOWS OVER DAM

ASSUME EQUIVALENT FLOWS FOR THE SLOPING PORTIONS OF THE TERRAIN AT THE SIDES OF THE DAM AND DIKES (SEE OUTFLOW CURVE PG. D-5)

DAM

TOP OF DAM $Q_D \approx 2.7(175)(H-3.2)^{5/2} = 470(H-3.2)^{5/2}$

LEFT SIDE : $Q_{DL} \approx 2/3(2.0)(?)(H-3.2)^{5/2} = 12(H-3.2)^{5/2}$

DIKES

GROUP A (ELEV. (±) 425.5' NGVD)

TOP OF DIKE : $Q_{DK_1} \approx 2.0(280)(H-2)^{3/2} = 560(H-2)^{3/2}$

RIGHT SIDE : $Q_{DK,R} \approx 2/3(2.0X4)(H-2)^{5/2} = 5.3(H-2)^{5/2}$

LEFT SIDE : $Q_{DK,L_1} \approx 2/3(20)(2.0)(H-2)^{5/2} = 27(H-2)^{5/2}$ WHEN $H \leq 4'$

$Q_{DK,L_2} \approx 2.0(40)(H-2.47)^{3/2} = 80(H-2.47)^{3/2}$ WHEN $H > 4'$

GROUP B (ELEV. (±) 426.5' NGVD)

TOP OF DIKE : $Q_{DK_2} \approx 2.0(100)(H-3)^{3/2} = 200(H-3)^{3/2}$

RIGHT SIDE : $Q_{DK_2R} \approx 2/3(2.0)(20)(H-3)^{5/2} = 27(H-3)^{5/2}$ WHEN $H \leq 4'$

$Q'_{DK_2R} \approx 2.0(20)(H-3.23)^{3/2} = 40(H-3.23)^{3/2}$ WHEN $H > 4'$

NATURAL TERRAIN BETWEEN GROUPS 'B' AND 'C'

$Q_{DK_{2,3}} = 2.0(80)(H-4)^{3/2} = 160(H-4)^{3/2}$

CONVERSE LAKE DAM

2 CONT'D) OUTFLOW RATING CURVE

GROUP C (ELEV. (±) 425.5' M.S.L.D)

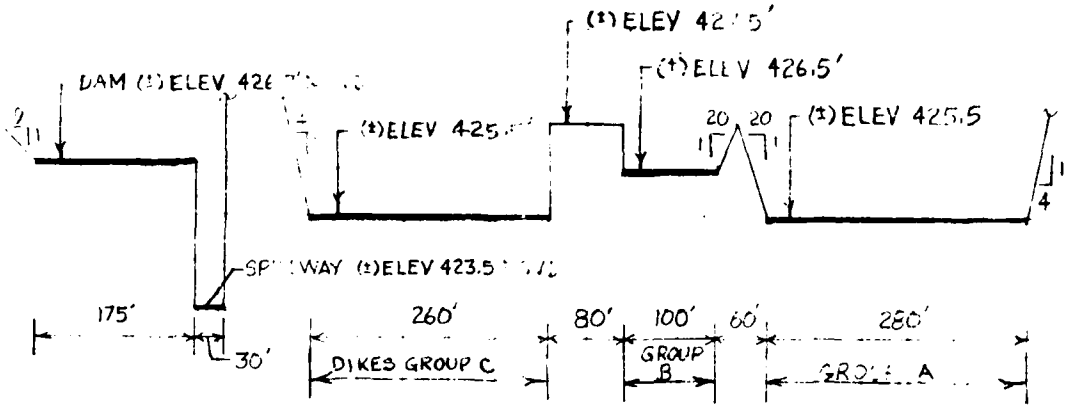
TOP OF DIKES $(2.0)(2.60)(H-2)^{3/2} = 5.2.0\,(H-2)^{3/2}$

LEFT SIDE : $Q_{DK_4L} = 2/3(2.0)(4)(H-2)^{5/2} \approx 5.3(H-2)^{5/2}$

THE TOTAL OUTFLOW RATING CURVE CAN BE APPROXIMATED BY:

$$Q \approx 470(H-3.2)^{3/2} + 90H^{3/2} \cdot 160(H-4)^{3/2} + 200(H-3)^{3/2} + 1080(H-2)^{3/2} + 12(H-3.2)^{5/2} + 10.6(H-2)^{5/2} + (Q_{DK_2R} \text{ OR } Q'_{DK_2R}) + (Q_{DK_1L} \text{ OR } Q'_{DK_1L})$$

THE OUTFLOW CURVE IS PLOTTED ON THE NEXT PAGE D-5



CONVERSE LAKE DAM, SPILLWAY, AND DIKES SECTION

b) SURCHARGE HEIGHT TO PASS PEAK FLOWS (Q_{P_1} & Q'_{P_1})

1) @ $Q_{P_1} \approx$ PMF $\approx$ 2500 CFS $H_1 \approx 3.4$

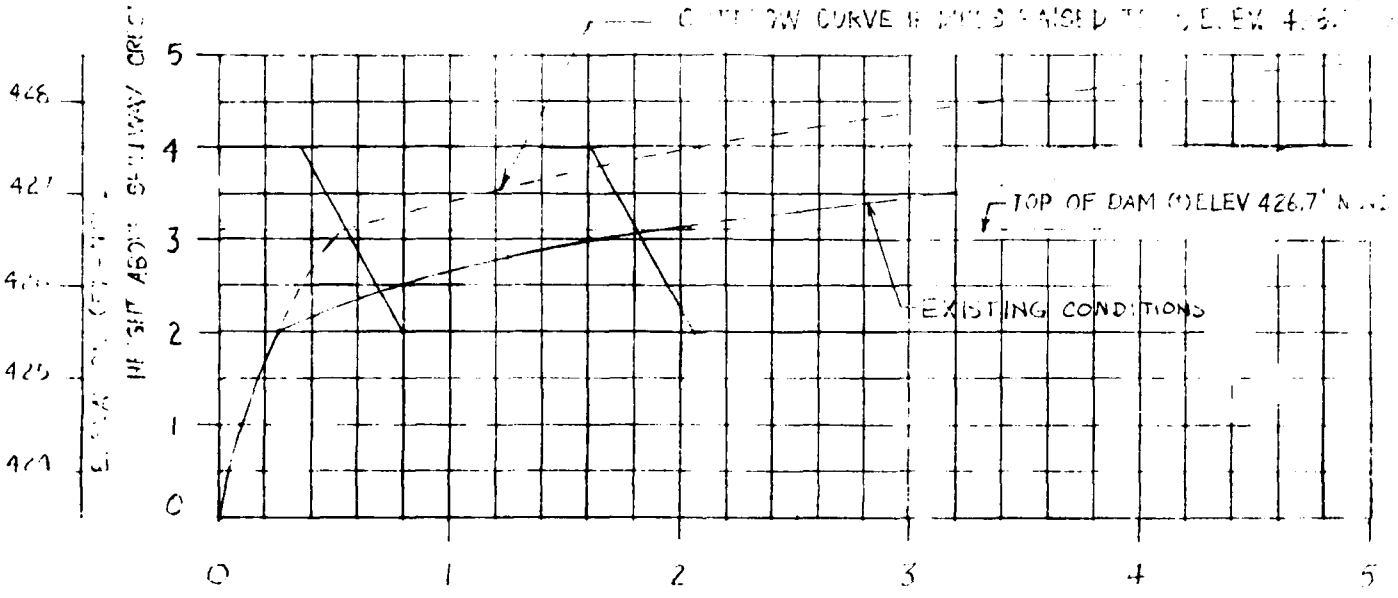
2) @ $Q'_{P_1} \approx$ 1/2 PMF $\approx$ 1250 CFS $H'_1 \approx 2.8$

Cahn Engineers Inc. — Consulting Engineers

Project NJ FEDERAL DAMS INSPECTION — Sheet D-5 of 13
Computed By K.R. JAHN — Checked By [illegible] — Date 11/4/
Field Book Ref — Other Refs. CL F 67 660 113 — Revisions

CONVERSE LAKE DAM

2 CONT'D) OUTFLOW RATINGS CURVE



THE CONVERSE LAKE DAM HAS A 16", (±) 90' LONG PIPE (VALVED D/S), AND ITS CAPACITY UNDER A HEAD OF (±) 26' (TOP OF DAM (±) ELEV 426.7' - ℄ OF OUTLET (±) ELEV 400.4 NGVD) IS ESTIMATED AT (±) 24 CFS. THE DAM ALSO HAS A 21", (±) 50' PIPE AND ITS CAPACITY UNDER A HEAD OF (±) 22.5' (TOP OF DAM (±) ELEV 426.7' NGVD - ℄ OF OUTLET (±) 404.2' NGVD) IS ESTIMATED AT (±) 55 CFS. THESE FLOWS HAVE BEEN NEGLECTED FROM COMPUTATIONS OF THE RATING CURVE.

c) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOW

1) AVG. LAKE AREA WITHIN EXPECTED SURCHARGE

1) LAKE AREA AT NORMAL POOL LEVEL = ELEV 423.5 NGVD (ASSUMED TO BE EQUIVALENT TO AREA AT ELEV 426*) $A_{423.5} \approx 94$ Ac

2) AREA AT CONTOUR 430 $A_{430} \approx 110$ Ac

3) AREA AT CONTOUR 440 $A_{440} \approx 150$ Ac

AREA AT ELEV 428 (MAX. EXPECTED SURCHARGE) $A_{428} \approx$ 94 + 16(45)/65 ≈ 105 Ac

∴ AVG AREA WITH EXPECTED SURCHARGE $\bar{A} \approx 100$ Ac

* NOTE: AREAS FROM USGS MAP: KISKO, N.Y. QUAD. SHEET

CONVERSE LAKE DAM

2c-CONT'D) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOWS

(a) WATERSHED AREA DA = 1.09 Sq. Mi (SEE PG. D-1)

(c) DISCHARGE (Q_{P_2}) AT VARIOUS HYPOTHETICAL SURCHARGE ELEVATIONS

H = 4' V = 100 × 4 ≈ 400 Ac-ft S = 400/(1.09 × 53.3) ≈ 6.8

H = 2' V = 100 × 2 ≈ 200 Ac ft S = 200/(1.09 × 53.3) ≈ 3.44

FROM APPROXIMATE ROUTING NED-ACE GUIDELINES AND 19" MAX. PROBABLE R.O. IN NEW ENGLAND :

$Q_{P_2} = Q_{P_1}(1 - S/19)$ AND FOR ½ PMF $Q_{P_2}' = Q_{P_1}'(1 - S/19.5)$

∴ FOR THE HYPOTHETICAL SURCHARGE

H = 4' $Q_{P_2} \approx 1590$ CFS $Q_{P_2}' \approx 340$ CFS

H = 2' $Q_{P_2} \approx 2050$ CFS $Q_{P_2}' \approx 800$ CFS

d) PEAK OUTFLOWS (Q_{P_3} & Q_{P_3}')

USING NED-ACE GUIDELINES SURCHARGE STORAGE ROUTING ALTERNATE METHOD (SEE RATING CURVE PG D-5)

$Q_{P_3} \approx 1730$ CFS $H_3 \approx 3.1'$ FOR Q_{P_1} PMF

$Q_{P_3}' \approx 690$ CFS $H_3' \approx 2.5$ FOR Q_{P_1}' = ½ PMF

CONVERSE LAKE DAM

SPILLWAY CAPACITY RATIO TO FLOW INFLOWS AND OUTFLOWS

a) SPILLWAY CAPACITY TO TOP OF DAM ($H = 3.2'$, $Q_s = 520$ CFS)

THE SPILLWAY CAPACITY IS (+) 21% OF THE INFLOW (Q_P) AND (+) 28% OF THE OUTFLOW (Q_{P_3}) AT PEAK FLOOD = PMF. LIKEWISE IT IS (+) 41% OF THE INFLOW (Q'_P) AND (+) 75% OF THE OUTFLOW (Q'_{P_3}) AT PEAK FLOOD ½ PMF.

BECAUSE THE ESTIMATED SURCHARGES TO PASS PMF AND ½ PMF ARE LOWER THAN THE TOP OF THE DAM, THE CAPACITY RATIO TO THESE SURCHARGES IS NOT ESTIMATED. HOWEVER, THE RATIO OF SPILLWAY OUTFLOW TO TOTAL OUTFLOW FOR VARIOUS LAKE ELEVATIONS IS SUMMARIZED BELOW

SURCHARGE H (FT)	LAKE ELEV. (NGVD)	TOTAL OUTFLOW (CFS) (*)	SPILLWAY OUTFLOW (CFS)	PERCENTAGE OF TOT. OUTFLOW
0	425.5'	250	250	100%
0.5 **	426.0'	690	360	52%
1.1 ***	426.6'	1790	490	27%

* AS THE SURCHARGE ABOVE THE SPILLWAY CREST RISES ABOVE 2', THE MAJORITY OF THE OUTFLOW WILL BE PASSED OVER THE DIKES TO THE RIGHT OF THE DAM. SEE SECTION OF DAM, SPILLWAY AND DIKES PG. D-4.

** SURCHARGE WHEN TOTAL OUTFLOW = Q'_{P_3}

*** SURCHARGE WHEN TOTAL OUTFLOW = Q'_P

CONVERSE LAKE DAM

II) DOWNSTREAM FAILURE HAZARD

1) POTENTIAL IMPACT AREA UPON FAILURE OF CONVERSE LAKE DAM OR DIKES*

a) IF FAILURE OCCURS, THE CORRESPONDING FLOOD WOULD TRAVEL ALONG CONVERSE POND BROOK. THERE IS A HOUSE APPROXIMATELY 10000' D/S FROM THE DAM WITH FF AT (±) 5.5' ABOVE THE BROOK, FOUR OTHER HOUSES, TWO (±) 2.5 MI. D/S WITH FF AT (±) 10' AND TWO (±) 5.1 MI D/S WITH FF AT (±) 7.5' WERE FOUND..

c) FAILURE AT CONVERSE LAKE DAM

a) BREACH WIDTH

b) HEIGHT OF DAM
TOP OF DAM (±) ELEV 426.7' NGVD
LOWEST POINT D/S (±) ELEV 396.9' NGVD
∴ H = 29.8' SAY 30'

c) MID HEIGHT (±) ELEV 412' NGVD (426.7 - 30/2 = 411.7, SAY 412' NGVD.

d) APPROX. MID HEIGHT LENGTH $l \approx 110'$ (C.E. FIELD MEASUREMENT 10/10)

e) BREACH WIDTH (SEE NEJ/ACE D/S DAM FAILURE GUIDELINES)

$W = 0.4 \times 110 \approx 44$ ASSUME $W_b \approx 40'$

* NOTE : THE IMPACT AREA AFFECTED BY THE FAILURE OF THE DAM AND/OR DIKES IS THE SAME.

CONVERSE LAKE DAM

2 CONT'D) FAILURE AT CONVERSE LAKE DAM

b) PEAK FAILURE OUTFLOW (Q_{P_1})

ASSUME THE TEST FLOOD (½ PMF) (SEE PG 11) SURCHARGE CONDITIONS; (H_s – 2.5', (±) ELEV 426.0' NVGD) SINCE THE LAM IS NOT OVERTOPPED. (TOP OF DAM ELEV 426.7' NVGD).

i) HEIGHT AT TIME OF FAILURE Y_o = 426.0 − 396.9 = 29.1' SAY 29'

ii) TOTAL OUTFLOW TO CONVERSE POND BROOK $Q_o \approx 690$ CFS
(SPILLWAY AND DIKE 3 OVERFLOW; SEE PG. D-7)

iii) BREACH OUTFLOW (Q_b)

$$Q_b = (8/27) W_b \sqrt{g}\, Y_o^{3/2} \approx 10500 \text{ CFS}$$

iv) PEAK FAILURE OUTFLOW TO CONVERSE POND BROOK

$$Q_{P_1} \approx Q_o + Q_b \approx \underline{\underline{11000}} \text{ CFS}$$

c) FLOOD DEPTH IMMEDIATELY D/S FROM DAM

$$Y = 0.44\, Y_o = \underline{\underline{13'}}$$

d) ESTIMATE OF D/S DAM FAILURE CONDITIONS AT THE IMPACT AREA

THE CONVERSE POND BROOK CHANNEL IS (±) 40' WIDE, AND SLOPES (±) 80' IN 10,000' ((±) 0.8%). THE SIDE SLOPE (±) 5H TO 1V TO THE LEFT AND (±) 6H TO 1V TO THE RIGHT. ASSUME n (≈ 0.050)

i) APPROXIMATE STAGE AT POTENTIAL IMPACT AREA AFTER FAILURE

$Q_{P_1} \approx 11000$ CFS, $Y_1 \approx 4.0$, $V_1 \approx 390$ AcFt ($S_1 \approx$ 600 AcFt) ON REACH OF 10000'. ($S \approx$ 1200 AcFt, SEE PG 11) *TEST FLOOD SURCHARGE

CONVERSE LAKE DAM

c CONT'D) FAILURE AT CONVERSE LAKE DAM

$Q_{P_2} \approx 7400$ CFS $Y_2 \approx 3.2'$ $V_2 \approx 300$ Ac-Ft ; $\bar{V} \approx 350$ Ac-Ft

$Q_{P_3} \approx 7800$ CFS,

$\therefore$ REAL OUTFLOW : $Q_P \approx 7800$ CFS, STAGE $Y_2 \approx 3.5'$

c) APPROXIMATE STAGE BEFORE FAILURE

CONVERSE POND BROOK CHANNEL (TOTAL) OVERFLOW $Q_O \approx 690$ CFS, $Y_o \approx 0.8'$

f) RAISE IN STAGE AT IMPACT AREA $\Delta Y \approx 2.5'$

NOTE : IF DIKES ARE RAISED TO THE TOP OF DAM ELEVATION, (+)426.5' MSL THE TOTAL OUTFLOW IN CASE OF FAILURE WILL ALSO BE (±) $Q_o \approx 11{,}000$ CFS. [illegible] ≈ 500 CFS, $Q_b \approx 10500$ CFS), AND THE FAILURE CONDITION EFFECT WILL BE APPROXIMATELY THE SAME.
SIMILARLY, IF FAILURE OF THE DIKES OCCUR, BECAUSE THEIR ACTUAL HEIGHT ($H_{MAX.} = (+)15'$) AND WATER LEVEL AT TIME OF FAILURE ((+)ELEV. 425.5' MSL) ARE LOWER THAN FOR THE CASE OF DAM FAILURE, THE EXPECTED FAILURE CONDITION EFFECT WILL BE MINIMIZED.

CONVERSE LAKE DAM

III). SELECTION OF TEST FLOOD

1) CLASSIFICATION OF DAM ACCORDING TO NI D ACE GUIDELINES

a) SIZE * STORAGE (MAX) ≥ 1220 Ac·Ft (1000 < S < 50000 Ac·Ft)
* HEIGHT ≅ 30' (25 < H < 40')

NOTE : STORAGE : AT FLOW LINE (EL 423.5' MSL) IS APPROXIMATELY 300 MG ((1) 920 Ac·Ft.).
(INFORMATION IN LETTER BY JOSEPH W. CONE, P.E., 12/66)
MAX. STORAGE = 920 + 3.2 × 94 Ac (S.A.) = 1220 Ac·Ft
AT TEST FLOOD, S = 1160 Ac·Ft
HEIGHT : C.E. FIELD SURVEY 10/79

∴ SIZE CLASSIFICATION : INTERMEDIATE

b) HAZARD POTENTIAL : AS SHOWN BY THE D/S FAILURE ANALYSIS THE POTENTIAL FOR LOSS OF LIFE UPON FAILURE OF THE DAM OR DIKES IS RELATIVELY LOW AT THE IMPACT AREA DESCRIBED ON PG. D-8. THE ECONOMIC LOSS MAY BE HIGH, HOWEVER, BECAUSE OF THE RELATIVELY LARGE BODY OF WATER WHICH WILL BE RELEASED AND THE CORRESPONDING HIGH FLOOD FLOW WHICH WILL BE GENERATED. THE BODY OF WATER WILL PROBABLY CAUSE SIGNIFICANT DAMAGE TO SEVERAL STRUCTURES AT ROAD CROSSINGS AND TO THE HIGH VALUED PROPERTY WHICH IN GENERAL, BORDERS CONVERSE POND BROOK. THEREFORE, THE CONVERSE LAKE DAM IS CLASSIFIED AS HAVING :
HAZARD CLASSIFICATION : SIGNIFICANT

c) TEST FLOOD 1/2 PMF = 1250 CFS
THIS SELECTION HAS BEEN MADE IN VIEW OF THE RESULTS OF THE PREVIOUS ANALYSIS AND CLASSIFICATION.

CONVERSE LAKE DAM

IV) SUMMARY AND CONCLUSIONS

1) TEST FLOOD = ½PMF = 1250 CFS
(PARALLEL COMPUTATIONS HAVE BEEN MADE FOR FULL PMF = 2500 CFS AND ARE ALSO SUMMARIZED BELOW)

2) PERFORMANCE AT PEAK FLOOD CONDITIONS

a) PEAK INFLOW Q_{P_1} = PMF ≅ 2500 CFS Q_{P_1}' = ½ PMF = 1250 CFS

b) PEAK OUTFLOW Q_{P_2} = 1790 CFS Q_{P_3}' = 690 CFS

c) SPILLWAY CAPACITY TO TOP OF DAM (H = 3.2') Q_S ≅ 520 CFS, OR (±) 28% OF Q_{P_3} OR (±) 75% OF Q_{P_3}'

THEREFORE AT TEST FLOOD Q_{P_1}' = ½ PMF, THE SPILLWAY AND DIKES MAY PASS THE FULL OUTFLOW WITH A FREEBOARD TO THE TOP OF THE DAM OF (±) 0.7' (WS ELEV. (±) 426.0' MSL) AND A COORESPONDING SURCHARGE ABOVE THE SPILLWAY CREST ((±) ELEV. 423.5' MSL) OF (±) 2.5'.

SIMILARLY, AT Q_{P_1} = PMF, THE SPILLWAY AND DIKES CAN PASS THE FULL OUTFLOW WITH A FREEBOARD TO THE TOP OF THE DAM OF (±) 0.1' (WS ELEV (±) 426.6' MSL) AND A COORESPONDING SURCHARGE ABOVE THE SPILLWAY CREST OF (±) 3.1'.

HOWEVER, IF THE DIKES ARE RAISED TO THE TOP OF DAM ELEVATION OF (±) 426.7' MSL, THE COORESPONDING SURCHARGE ABOVE THE SPILLWAY CREST ELEVATION WILL BE (±) 3.8' (W.S. ELEV 427.8' MSL) FOR Q_{P_1} = PMF. LIKEWISE, THE SURCHARGE ABOVE SPILLWAY CREST ELEVATION WILL BE (±) 3.2' (W.S. ELEV (±) 426.7' MSL) FOR THE TEST FLOOD. (½ PMF)

CONVERSE LAKE DAM

V CONCLUSIONS SUMMARY AND CONCLUSIONS

3. DOWNSTREAM FAILURE CONDITIONS

a. CONVERSE LAKE DAM

i) PEAK FAILURE OUTFLOW $Q_o \approx 11000$ CFS

b) FLOOD DEPTH IMMEDIATELY D/S FROM DAM $Y_o \approx 13'$

c) CONDITIONS AT POTENTIAL IMPACT AREA D/S FROM DAM (CONVERSE POND BROOK)

i) APPROXIMATE STAGE BEFORE FAILURE $Y_n \approx 0.8' (Q_o \approx 690$ CFS)

ii) APPROXIMATE STAGE AFTER FAILURE $Y_x \approx 3.3'$ ($Q_{P_2} \approx 7800$ CFS)

iii) APPROXIMATE RAISE IN STAGE AFTER FAILURE $\Delta Y \approx 2.5'$

NOTES: IF THE DIKES ARE RAISED TO THE TOP OF DAM ELEVATION (±) 426.7' MSL. THE TOTAL OUTFLOW IN CASE OF FAILURE WOULD ALSO BE (±) 11000 CFS, AND THE FAILURE CONDITIONS WOULD BE APPROXIMATELY THE SAME.

SIMILARLY, IF FAILURE OF THE DIKES OCCUR, ($H_{MAX} \approx 15'$, WS ELEV (±) 425.5' MSL), THE EXPECTED FAILURE CONDITION IS LESS SIGNIFICANT. THE MAXIMUM BREACH WIDTH OF THE DIKES IS 40' (±) AND THE EXPECTED Q_b WOULD BE LESS THAN 4500 CFS.

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

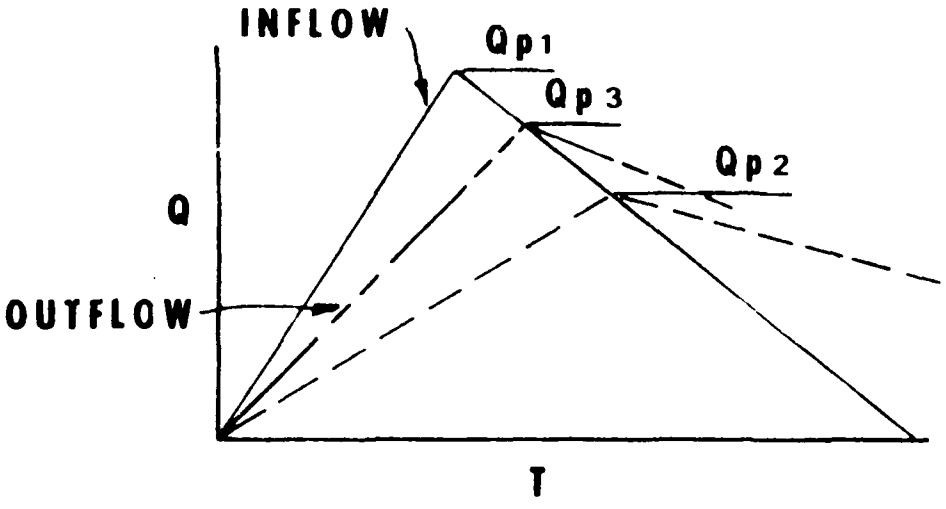
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS
BASED ON TWICE THE
STANDARD PROJECT FLOOD
(Flat and Coastal Areas)

River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1. Pawtuxet River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Hopk.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

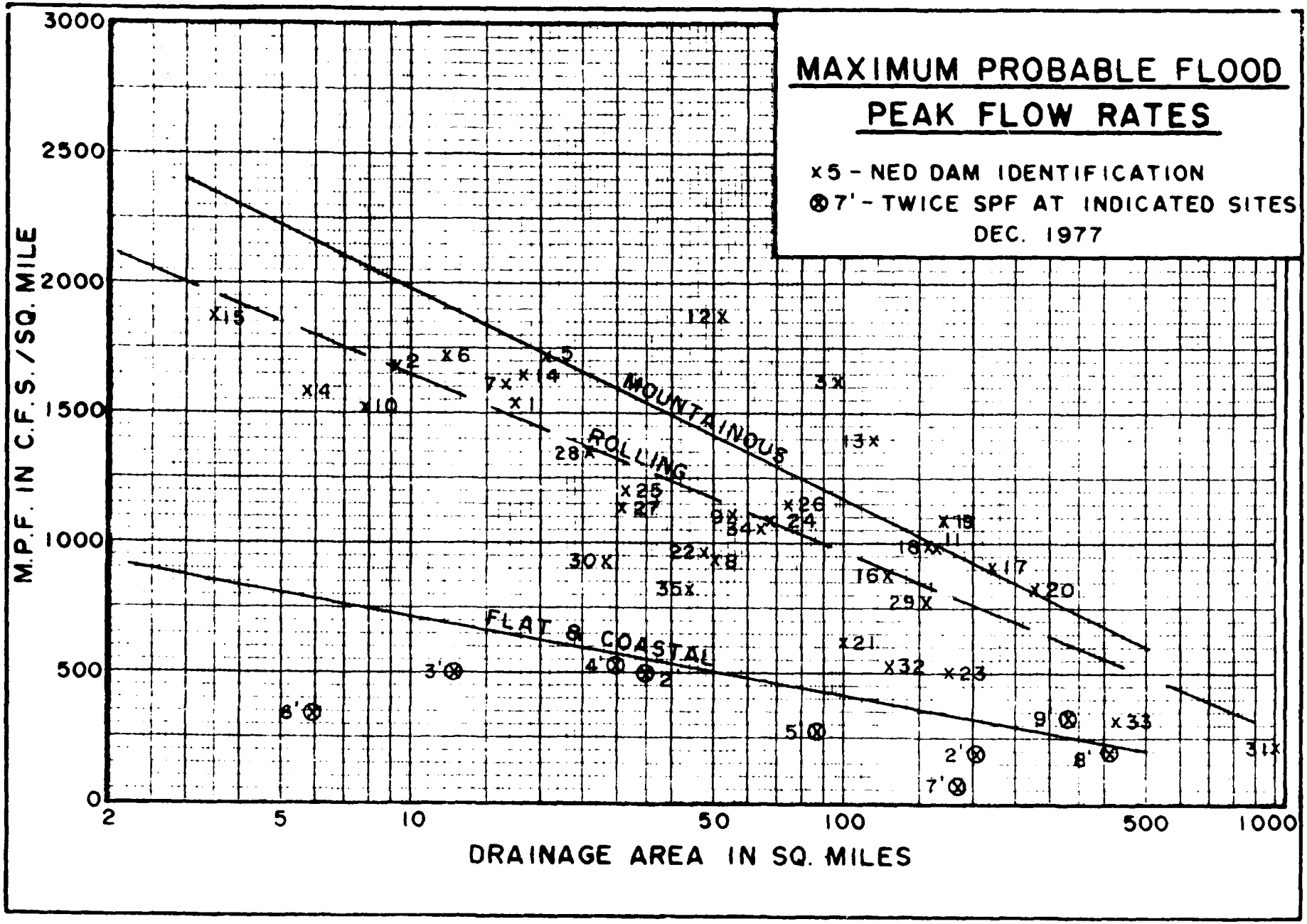
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL
x15
x4
x10
x2
x6
x5
7x
x14
x1
12x
3x
13x
28x
x25
x27
x26
9x
84x
x24
x18
11
18x
x17
x20
16x
29x
30x
22x
x8
35x
x21
x32
x23
3'⊗
4'⊗
2
8'⊗
5'⊗
9'⊗
x33
2'⊗
8'⊗
7'⊗
31x

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

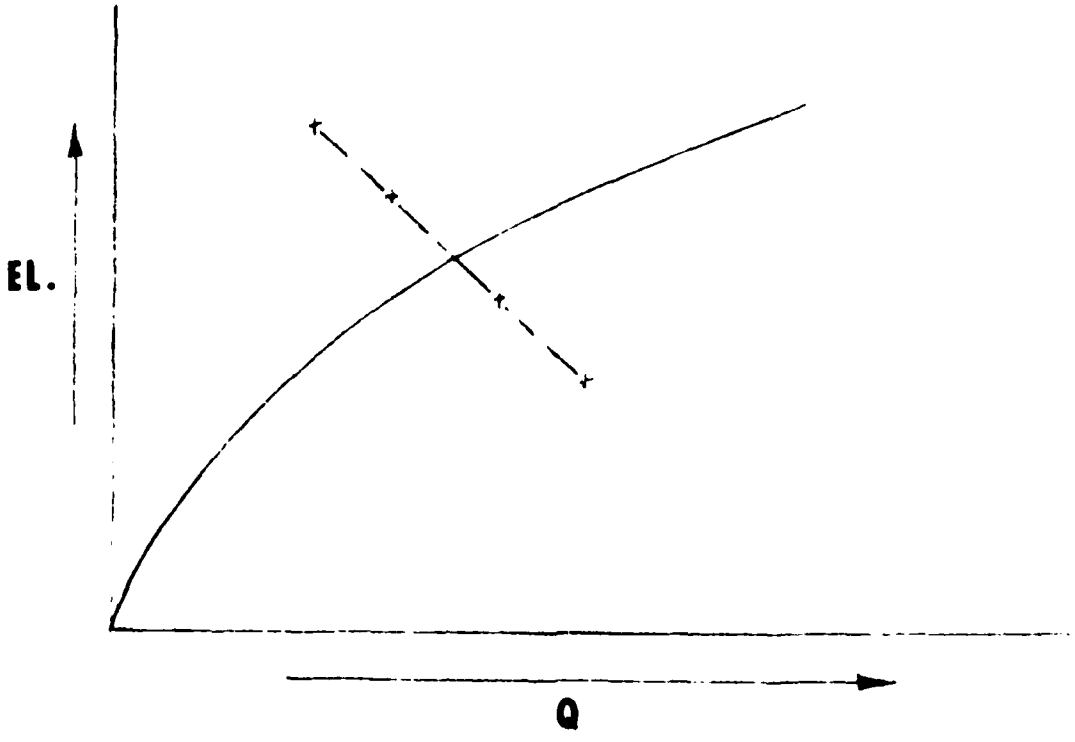
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

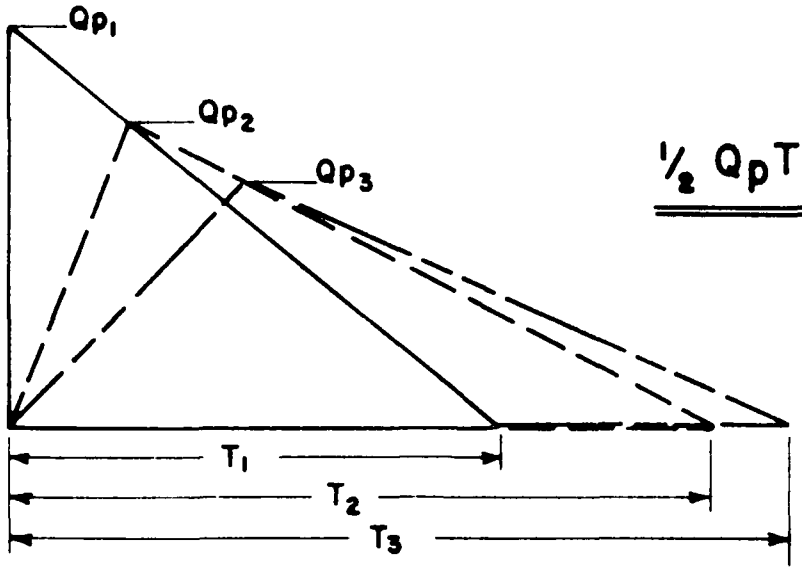
$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19'' R.O.

Q_{p2}	STOR	EL.



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Qp_1 = \frac{8}{27} W_b \sqrt{g} Y_o^{\frac{3}{2}}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40' OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Qp_2(TRIAL) = Qp_1 (1 - \frac{V_1}{S})$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Qp_2 = Qp_1 (1 - \frac{V_{AVG}}{S})$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

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8 [illegible]

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